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ANTIBIOTIC MASTERY WORKBOOK FOR CLINICIANS

The Updated Reference Guide to Navigate Drug Selection Decisions Quickly and Efficiently with 1000+ Practical Exercises and Real-World Clinical Scenarios

NEW EDITION

1000+ FOR NURSES AND CLINICIANS

PRACTICAL EXERCISES

MICHAEL A. HOPKINS

ANTIBIOTIC MASTERY WORKBOOK FOR CLINICIANS

The Updated Reference Guide to Navigate Drug Selection Decisions Quickly and Efficiently with 1000+ Practical Exercises and Real-World Clinical Scenarios

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DISCLAIMER

This workbook is designed as a supplementary learning resource to enhance clinical decision-making and antibiotic prescribing skills through structured exercises, case-based learning, and interactive problem-solving. It serves as a practical study aid to reinforce key concepts but is not intended to replace comprehensive medical textbooks, clinical guidelines, or official antimicrobial stewardship protocols.

While every effort has been made to ensure accuracy and clarity, this workbook should **not** be used as a sole reference for clinical decision-making. Proper antibiotic selection requires clinical judgment, correlation with patient

history, microbiological data, and adherence to institutional and international guidelines.

We strongly recommend using this workbook alongside authoritative medical references, including clinical guidelines from IDSA, WHO, CDC, and national antimicrobial stewardship programs. For patient care decisions, always rely on evidence-based guidelines, institutional policies, and professional expertise to ensure precision, safety, and optimal therapeutic outcomes.

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INTRODUCTION

Every day, clinicians across emergency departments, urgent care centers, primary care offices, and hospital wards face the same critical challenge: ***selecting the right antibiotic for the right patient at the right dose for the right duration***. It sounds straightforward, yet the reality is far more complex. With dozens of antimicrobial agents available, emerging resistance patterns, evolving guidelines, and the constant pressure to practice good stewardship while ensuring optimal patient outcomes, antibiotic prescribing has become one of the most demanding aspects of clinical practice.

You've probably experienced that moment of uncertainty when standing at a patient's bedside or reviewing a case—knowing you need to start antimicrobial therapy but second-guessing your choice. Should you choose the narrow-spectrum agent to minimize resistance, or opt for broader coverage given the patient's clinical picture? How do you adjust the dose for that elderly patient with mild kidney impairment? When exactly should you switch from IV to oral therapy? These decisions happen hundreds of times throughout your career, and each one matters deeply to patient outcomes.

The challenge isn't just about knowing which drugs exist or memorizing their mechanisms of action. Modern antibiotic prescribing requires synthesizing complex clinical information rapidly while considering patient-specific factors, local resistance patterns, drug allergies, interactions, and cost considerations. You need to balance the immediate need to treat infection effectively against the long-term consequences of antimicrobial resistance.

Meanwhile, guidelines continue to evolve, new agents enter the market, and resistance patterns shift in your practice environment.

This workbook emerged from a simple recognition: while excellent reference guides exist, very few resources bridge the gap between theoretical knowledge and practical application. You can look up dosing information or review treatment algorithms, but where do you go to actually practice making these decisions? Where can you work through realistic scenarios that mirror the complexity of actual patient encounters? How do you build the pattern recognition that comes only through repeated exposure to diverse clinical situations?

Traditional medical education often treats antibiotic prescribing as a series of facts to memorize rather than clinical reasoning skills to develop. You learn about beta-lactam rings and minimum inhibitory concentrations, but spend less time working through the nuanced decision-making that defines competent prescribing. This approach leaves many clinicians feeling underprepared when facing real patients with complicated presentations that don't fit neatly into textbook categories.

The concept for this workbook began during conversations with residents, nurse practitioners, physician assistants, and attending physicians who consistently expressed frustration with existing resources. They wanted something more than a quick reference card but less overwhelming than a comprehensive infectious diseases textbook. They needed a tool that would help them think through problems systematically while providing immediate feedback on their reasoning. Most importantly, they wanted to practice these skills in a low-stakes environment before applying them in patient care.

What makes this resource different is its foundation in active learning principles. Rather than simply presenting information for passive consumption, every section engages you in making decisions, solving problems, and working through clinical scenarios. The exercises aren't abstract academic problems—they're drawn from real clinical encounters that reflect the complexity and ambiguity you face daily. Each scenario builds on previous learning while introducing new concepts and challenges.

The structure intentionally mirrors how you actually encounter these problems in practice. Patients don't present with neat diagnostic labels and obvious treatment choices. They come with chief complaints, physical findings, and clinical pictures that require interpretation. This workbook guides you through that interpretive process, helping you develop the clinical reasoning patterns that experienced clinicians use intuitively.

Perhaps most importantly, this isn't just about individual drug selection. Modern antibiotic prescribing exists within a broader context of antimicrobial stewardship, quality improvement, and population health. Every prescribing decision contributes to larger patterns of resistance and resource utilization. This workbook helps you understand these connections while maintaining focus on optimal individual patient care.

The exercises progress systematically from fundamental concepts through increasingly complex clinical scenarios. Early sections ensure you have solid grounding in basic principles before moving to nuanced decision-making in special populations or unusual circumstances. Each exercise includes detailed explanations that illuminate not just the correct answer, but the reasoning process that leads to good clinical decisions.

Whether you're a medical student beginning to learn about antimicrobial therapy, a resident building confidence in independent prescribing, or an experienced clinician seeking to refine your approach and stay current with evolving best practices, this workbook meets you where you are in your learning journey. The goal isn't to replace clinical judgment with algorithmic thinking, but rather to strengthen the foundation of knowledge and reasoning skills that inform sound clinical judgment.

As you work through these pages, you'll find yourself developing the kind of systematic approach to antibiotic prescribing that characterizes excellent clinicians. You'll learn to ask the right questions, consider the relevant factors, and make decisions with greater confidence and accuracy. Most importantly, you'll be contributing to the larger goal of optimizing antimicrobial use for current patients while preserving these vital therapeutic tools for future generations.

SECTION I: RAPID ANTIBIOTIC REVIEW

Before diving into specific clinical conditions and complex prescribing scenarios, we need to ensure you have a solid foundation in the fundamental principles that guide all antimicrobial decision-making. Think of this section as your essential toolkit—the core knowledge that you'll draw upon repeatedly as you work through more advanced clinical problems throughout this workbook.

Many clinicians feel overwhelmed by the sheer number of antimicrobial agents available today. Walk into any hospital pharmacy and you'll find dozens of different antibiotics, each with its own spectrum of activity, dosing requirements, and clinical considerations. The key to mastering this complexity isn't memorizing every detail about every drug, but rather understanding the organizing principles that make sense of the apparent chaos.

This rapid review takes a different approach than traditional pharmacology courses or reference texts. Instead of presenting exhaustive lists of drug properties, we focus on the practical knowledge that directly impacts your prescribing decisions. You'll learn to think about antibiotics in terms of their clinical utility rather than just their biochemical mechanisms. While understanding how beta-lactams inhibit cell wall synthesis is certainly important, what matters more in daily practice is knowing when to choose amoxicillin versus cephalexin versus azithromycin for a patient with community-acquired pneumonia.

The exercises in this section are designed to build pattern recognition and reinforce key concepts through active application. Rather than simply reading about drug classes, you'll practice identifying them in clinical scenarios. Instead of memorizing spectrum charts, you'll work through problems that require you to match pathogens with appropriate antimicrobial coverage. These exercises mirror the kind of thinking you do when evaluating real patients, helping you develop the rapid decision-making skills that characterize competent prescribing.

One of the most important themes running through this section is the concept of antimicrobial stewardship. Good prescribing isn't just about choosing an effective antibiotic—it's about selecting the most appropriate agent considering factors like resistance patterns, side effect profiles, cost, and ecological impact. You'll learn to think beyond the immediate clinical question to consider broader implications of your prescribing decisions.

We'll also address some of the most common misconceptions and pitfalls that trap even experienced clinicians. Many prescribing errors stem not from lack of knowledge about individual drugs, but from flawed reasoning about clinical scenarios. For example, the tendency to reach for broad-spectrum agents when narrow-spectrum options would be more appropriate, or the habit of continuing antibiotics longer than necessary "just to be safe." Understanding these cognitive traps helps you avoid them in your own practice.

The pacing in this section is intentionally brisk. We cover a lot of ground quickly, but with sufficient depth to ensure you understand the underlying principles. If you find yourself struggling with any particular concept, don't worry—these same principles will be reinforced repeatedly throughout the

clinical sections that follow. The goal here is to establish a foundation that will support more complex learning later.

Pay particular attention to the sections on drug interactions and adverse effects. These topics often receive insufficient emphasis in medical training, yet they're crucial for safe prescribing. A technically correct antibiotic choice becomes inappropriate if it interacts dangerously with the patient's other medications or poses unacceptable risks given their medical history.

The exercises incorporate increasing levels of complexity as you progress through the section. Early problems focus on basic drug identification and classification. Later exercises require you to integrate multiple factors when making prescribing decisions. This progression mirrors how expertise develops in clinical practice—from simple pattern recognition to sophisticated clinical reasoning.

Throughout this section, you'll notice we emphasize practical clinical pearls alongside fundamental principles. These insights come from experienced clinicians who have learned through years of practice how to navigate common challenges and avoid frequent mistakes. While guidelines and textbooks provide the scientific foundation for prescribing decisions, these practical insights help you implement that knowledge effectively in real clinical situations.

Remember that mastering antimicrobial prescribing is a career-long process. The rapid review in this section provides essential building blocks, but true expertise develops through repeated application of these principles in diverse clinical contexts. The goal isn't to memorize everything perfectly before moving forward, but rather to

understand the key concepts well enough to apply them confidently in the clinical scenarios that follow.

As you work through the exercises, focus on understanding the reasoning behind correct answers rather than simply identifying them. The patterns of thinking you develop here will serve you throughout your clinical career, helping you make sound prescribing decisions even in unfamiliar situations where you can't rely on memorized algorithms or predetermined protocols.

CHAPTER 1: QUICK ANTIBIOTIC OVERVIEW

Major Antibiotic Classes and Their Primary Uses

Walk into any pharmacy and you'll be confronted with an overwhelming array of antimicrobial agents—dozens of different drugs with complex names, varying mechanisms of action, and specific clinical applications. The good news is that beneath this apparent complexity lies a logical organizational structure based on chemical families and clinical utility. Understanding these major antibiotic classes and their primary uses provides the foundation for all intelligent prescribing decisions.

Think of antibiotic classes like different types of tools in a well-organized workshop. Just as you wouldn't use a hammer when you need a screwdriver, choosing the right antibiotic class for a particular infection dramatically improves your chances of clinical success while minimizing unnecessary side effects and resistance development. Each class has evolved to address specific types of bacterial threats, and understanding these relationships helps you make more informed choices.

1. Beta-Lactam Family

The beta-lactam family represents the largest and most versatile group of antibiotics in clinical use today. This family includes penicillins, cephalosporins, carbapenems, and monobactams—drugs that share a common mechanism of

action but differ significantly in their spectrum of activity and clinical applications.

Penicillins

- Remain the gold standard for treating streptococcal infections
- Best choice for strep throat and many cases of pneumonia
- When a patient presents with classic bacterial pharyngitis and positive rapid strep test, amoxicillin or penicillin is your optimal first choice
- Targeted activity with excellent safety profile and minimal impact on normal bacterial flora

Cephalosporins

- Expand the beta-lactam concept with broader spectrum coverage
- Greater stability against bacterial enzymes that inactivate penicillins
- *First-generation* (cephalexin): Excel at skin and soft tissue infections caused by staphylococci and streptococci
- Go-to choice for cellulitis in penicillin-allergic patients or when broader coverage needed
- *Third-generation* (ceftriaxone): Excellent gram-negative coverage with good CNS penetration
- Invaluable for treating meningitis and serious gram-negative infections

Carbapenems

- The "big guns" of the beta-lactam world
- Drugs like meropenem and imipenem offer incredibly broad spectrum activity

- Cover both gram-positive and gram-negative bacteria, including many resistant strains
- **Important:** Reserve for seriously ill patients with resistant infections
- Overuse drives resistance to our most potent antimicrobials

2. Fluoroquinolones

Unique advantages:

- Excellent oral bioavailability achieving IV-comparable tissue concentrations
- Broad spectrum of activity
- Valuable for treating serious infections in outpatients

Primary uses:

- Urinary tract infections
- Certain types of pneumonia
- Bone and joint infections where oral therapy is preferred

Important considerations:

- Growing resistance patterns
- Serious side effects including tendon rupture and neurological complications
- More restrictive use recommendations due to safety concerns

3. Macrolides

Key agents: Azithromycin and clarithromycin

Excel at treating:

- Atypical respiratory pathogens (Mycoplasma, Chlamydia)
- Organisms that don't respond well to beta-lactams

Classic patient scenario:

- Pneumonia patient who doesn't look as sick as their chest X-ray suggests
- Often younger adults with dry cough and minimal sputum production
- Azithromycin's convenient dosing and excellent tissue penetration make it particularly popular

4. Tetracyclines

Renaissance in recent years due to increasing resistance to other classes

Doxycycline is remarkably versatile:

- Excellent activity against respiratory pathogens
- Effective for skin and soft tissue organisms
- Treats sexually transmitted infections
- Go-to choice for outpatient MRSA skin infections
- Anti-inflammatory properties provide additional benefits

5. Clindamycin

Unique combination: Gram-positive and anaerobic coverage

Particularly valuable for:

- Dental infections
- Aspiration pneumonia

- Skin and soft tissue infections with possible anaerobic involvement

Important risk: Association with *Clostridioides difficile* colitis

- Requires careful risk-benefit consideration
- Especially cautious use in elderly patients or those with recent healthcare exposure

6. Vancomycin

Cornerstone of therapy for serious MRSA infections

Special considerations:

- Requires individualized dosing based on kidney function and serum levels
- Unlike simple weight-based calculations used for many antibiotics
- Not an antibiotic to prescribe casually
- Patients need careful monitoring for both efficacy and toxicity

7. Aminoglycosides

Key agents: Gentamicin and tobramycin

Advantages:

- Excellent gram-negative coverage
- Often used in combination with other antibiotics for serious infections

Limitations:

- Potential for kidney and hearing damage
- Require careful dosing and monitoring

- Safer alternatives often available
- Remain valuable for specific situations, particularly critically ill patients with resistant gram-negative infections

Clinical Application Framework

The key to mastering these antibiotic classes isn't memorizing every detail about every drug, but rather understanding the clinical situations where each class excels:

- ***Young adult with uncomplicated skin infection***: Oral cephalexin
- ***Elderly patient with aspiration pneumonia***: Clindamycin (anaerobic coverage)
- ***Complicated urinary tract infection***: Fluoroquinolone therapy
- ***MRSA bacteremia***: Vancomycin

Understanding these patterns helps you think systematically about antibiotic selection. Instead of approaching each case as a unique puzzle, you can apply consistent reasoning based on:

- Patient's clinical presentation
- Likely pathogens
- Individual risk factors

This systematic approach leads to more consistent prescribing decisions and better patient outcomes.

Remember the Progressive Steps

Choosing the right antibiotic class is only the first step. You still need to:

1. Select the specific agent within that class
2. Determine appropriate dosing
3. Decide on treatment duration

But getting the class selection right puts you on the path toward optimal antimicrobial therapy.

As resistance patterns continue to evolve, some of these traditional relationships may change. What works well today might be less effective tomorrow as bacteria develop new resistance mechanisms. This dynamic nature of antimicrobial therapy underscores the importance of staying current with local resistance patterns and emerging treatment recommendations.

The exercises that follow will help you apply these concepts in realistic clinical scenarios, building the pattern recognition skills that characterize expert prescribers. Focus on understanding the reasoning behind each choice rather than memorizing specific answers—the goal is to develop flexible thinking skills that will serve you throughout your career.

Core Mechanisms of Action

Understanding how antibiotics actually kill bacteria isn't just academic exercise—it directly impacts your prescribing decisions and helps you anticipate both therapeutic effects and potential complications. When you understand that penicillin works by disrupting cell wall synthesis, you immediately grasp why it's ineffective against atypical organisms like Mycoplasma that lack traditional cell walls. This mechanistic thinking transforms prescribing from memorization into logical decision-making.

1. Cell Wall Synthesis Inhibition

The Target: Bacterial cell walls contain peptidoglycan, a unique structure absent in human cells

How It Works:

- Beta-lactams (penicillins, cephalosporins, carbapenems) bind to enzymes that cross-link peptidoglycan
- Without proper cross-linking, cell walls become fragile and bacteria literally burst from osmotic pressure
- Think of it like removing the steel framework from a skyscraper—the structure collapses

Clinical Implications:

- Most effective against rapidly dividing bacteria (actively building new cell walls)
- Less effective against dormant or slow-growing organisms
- Explains why beta-lactams work best when bacteria are in active growth phase
- Time-dependent killing: maintaining drug levels above minimum inhibitory concentration matters more than peak levels

Why This Matters: When treating serious infections, you need adequate dosing frequency to keep beta-lactam levels consistently above the target throughout the dosing interval.

2. Protein Synthesis Inhibition

The Target: Bacterial ribosomes (specifically 30S and 50S subunits) differ enough from human ribosomes to allow selective targeting

Major Classes and Their Targets:

- ***Aminoglycosides*** (gentamicin): Bind 30S subunit, cause misreading of genetic code
- ***Macrolides*** (azithromycin): Block 50S subunit, prevent protein chain elongation
- ***Tetracyclines*** (doxycycline): Bind 30S subunit, block amino acid attachment
- ***Clindamycin***: Binds 50S subunit, similar mechanism to macrolides

Clinical Implications:

- Generally bacteriostatic (stop growth) rather than bactericidal (kill directly)
- Rely on host immune system to clear stopped bacteria
- May be less effective in immunocompromised patients
- Concentration-dependent effects for aminoglycosides: higher peaks kill more bacteria

Why This Matters: In critically ill patients, you might prefer bactericidal agents when possible, while bacteriostatic agents work fine for most outpatient infections in healthy hosts.

3. DNA/RNA Interference

Fluoroquinolones: Target bacterial DNA gyrase and topoisomerase IV

- These enzymes are essential for DNA replication and repair
- Without functional DNA processing, bacteria cannot reproduce or maintain cellular functions

- Bactericidal mechanism with concentration-dependent killing

Clinical Implications:

- Achieve excellent tissue penetration, including into cells
- Effective against intracellular pathogens
- Rapid bactericidal activity
- Post-antibiotic effect: bacteria remain suppressed even after drug levels drop

Why This Matters: Fluoroquinolones can be dosed less frequently than some other antibiotics because of their prolonged effects, but resistance develops quickly if underdosed.

4. Cell Membrane Disruption

Polymyxins (colistin): Bind to bacterial cell membranes and create pores

- Causes rapid cell death through membrane leakage
- Reserved for multidrug-resistant gram-negative infections
- Significant toxicity limits widespread use

Clinical Implications:

- Immediate bactericidal effect
- No resistance cross-over with other antibiotic classes
- Nephrotoxicity requires careful monitoring
- Often used as last resort for extensively drug-resistant organisms

5. Metabolic Pathway Disruption

Trimethoprim-Sulfamethoxazole: Blocks folate synthesis pathway

- Bacteria must synthesize their own folate (humans obtain it from diet)
- Sequential blockade of two steps in folate pathway
- Without folate, bacteria cannot synthesize DNA and RNA

Clinical Implications:

- Synergistic combination is more effective than either component alone
- Bactericidal when both components are present
- Broad spectrum activity
- Useful for specific organisms like Pneumocystis

Practical Applications of Mechanistic Understanding

Combination Therapy Logic:

- Beta-lactam + aminoglycoside: Cell wall disruption enhances aminoglycoside penetration
- Different mechanisms can be synergistic rather than just additive

Resistance Patterns:

- Understanding mechanisms helps predict cross-resistance
- MRSA resistance to methicillin affects all beta-lactams because they share the same target
- Fluoroquinolone resistance often involves target modification, explaining high-level resistance

Timing Considerations:

- Time-dependent antibiotics (beta-lactams): Focus on maintaining adequate levels
- Concentration-dependent antibiotics (fluoroquinolones, aminoglycosides): Focus on achieving high peaks

Site-Specific Effectiveness:

- Mechanism affects tissue penetration and cellular uptake
- Fluoroquinolones excel at intracellular infections because of their DNA target
- Beta-lactams work well in extracellular spaces but penetrate cells poorly

Clinical Decision Framework

When selecting antibiotics, consider how mechanism relates to your clinical scenario:

- ***Rapidly progressive infection***: Choose bactericidal agents when possible
- ***Immunocompromised host***: Favor bactericidal over bacteriostatic agents
- ***Intracellular pathogen suspected***: Consider agents that penetrate cells well (fluoroquinolones, macrolides)
- ***Combination therapy needed***: Select agents with complementary mechanisms

This mechanistic understanding transforms antibiotic selection from rote memorization into logical problem-solving. Instead of simply remembering that "azithromycin treats atypical pneumonia," you understand that its mechanism allows effective penetration into respiratory epithelial cells where these organisms reside.

The exercises ahead will help you apply this mechanistic thinking to real clinical scenarios, building the foundation for sophisticated prescribing decisions throughout your career.

Essential Pharmacology for Prescribing

Pharmacology might seem like dry academic material, but understanding a few key principles dramatically improves your prescribing accuracy and patient safety. You don't need to memorize complex equations or detailed metabolism pathways—you need practical knowledge that directly impacts your daily prescribing decisions. The difference between a good antibiotic choice and a great one often comes down to understanding how drugs behave in the body.

1. Bioavailability: Oral vs. IV Considerations

Why This Matters: Not all oral antibiotics are created equal

High Oral Bioavailability (>90%):

- Fluoroquinolones (ciprofloxacin, levofloxacin)
- Clindamycin
- Doxycycline
- Metronidazole
- These achieve nearly identical blood levels whether given orally or intravenously

Moderate Oral Bioavailability (50-80%):

- Amoxicillin/clavulanate
- Cephalexin
- Azithromycin
- Still reliable for most infections, but IV may be needed for severe cases

Poor Oral Bioavailability (<50%):

- Vancomycin (essentially zero—only used orally for C. diff)
- Most cephalosporins (except cephalexin)
- Piperacillin-tazobactam

Clinical Application:

- Patient with serious skin infection improving on IV clindamycin can switch to oral with confidence
- Severe pneumonia patient on IV ceftriaxone should not switch to oral cephalexin—they're not equivalent
- Cost-conscious prescribing: use high bioavailability oral agents when clinically appropriate

2. Tissue Penetration: Getting Drugs Where They Need to Go

Central Nervous System (Blood-Brain Barrier):

- ***Good penetration***: Fluoroquinolones, third-generation cephalosporins, metronidazole
- ***Poor penetration***: First-generation cephalosporins, clindamycin, vancomycin
- ***Clinical pearl***: Meningitis requires antibiotics that cross the blood-brain barrier effectively

Bone and Joint Penetration:

- ***Excellent:*** Fluoroquinolones, clindamycin
- ***Good:*** Doxycycline, trimethoprim-sulfamethoxazole
- ***Poor:*** Most beta-lactams (except during acute inflammation)
- ***Why it matters***: Osteomyelitis treatment often requires weeks of therapy with agents that penetrate

bone

Respiratory Tract:

- ***Excellent lung penetration***: Macrolides, fluoroquinolones, doxycycline
- ***Good:*** Most beta-lactams achieve adequate lung levels
- ***Intracellular penetration***: Macrolides and fluoroquinolones reach intracellular pathogens better

Prostate Penetration:

- ***Good***: Fluoroquinolones, trimethoprim-sulfamethoxazole, doxycycline
- ***Poor:*** Most beta-lactams
- ***Clinical application***: Chronic prostatitis requires antibiotics that penetrate prostate tissue

3. Elimination and Dosing Adjustments

Renal Elimination (Dose adjustment needed in kidney disease):

- Most beta-lactams
- Fluoroquinolones
- Vancomycin
- Aminoglycosides

Hepatic Metabolism (Dose adjustment needed in liver disease):

- Clindamycin
- Metronidazole
- Some macrolides

Dual Elimination (Usually safer in organ dysfunction):

- Doxycycline
- Ceftriaxone (can adjust dosing interval instead of dose)

Clinical Impact:

- Elderly patient with reduced kidney function needs cephalexin dose reduction
- Patient with cirrhosis might need clindamycin dose adjustment
- Doxycycline often preferred in patients with kidney disease because no dose adjustment needed

4. Drug Interactions: Critical Safety Considerations

Warfarin Interactions (↑ bleeding risk):

- Metronidazole: Major interaction, monitor INR closely
- Trimethoprim-sulfamethoxazole: Significant interaction
- Fluoroquinolones: Moderate interaction
- Most beta-lactams: Minimal interaction

QT Prolongation (cardiac rhythm risk):

- Fluoroquinolones
- Macrolides (especially azithromycin)
- **Avoid** in patients with known QT prolongation or on other QT-prolonging drugs

Antacid/Mineral Interactions:

- Fluoroquinolones: Significantly reduced absorption with calcium, magnesium, iron

- Doxycycline: Reduced absorption with dairy products, antacids
- ***Clinical pearl***: Space these antibiotics 2-4 hours from antacids or supplements

5. Time vs. Concentration-Dependent Killing

Time-Dependent (Beta-lactams):

- Effectiveness depends on time above minimum inhibitory concentration
- ***Dosing strategy***: More frequent dosing or continuous infusion for severe infections
- ***Clinical example***: Severe pneumonia might benefit from ceftriaxone every 12 hours instead of every 24 hours

Concentration-Dependent (Fluoroquinolones, Aminoglycosides):

- Higher peak concentrations kill more bacteria
- ***Dosing strategy***: Optimize peak levels, can space doses further apart
- ***Clinical example***: Once-daily dosing often preferred for aminoglycosides

6. Post-Antibiotic Effect

Significant PAE:

- Fluoroquinolones
- Aminoglycosides
- Macrolides

Minimal PAE:

- Most beta-lactams (except carbapenems)

Clinical Relevance: Drugs with significant post-antibiotic effects can be dosed less frequently, and brief interruptions in therapy are less problematic.

7. Food Effects

Take with Food (↑ absorption or ↓ GI upset):

- Amoxicillin/clavulanate
- Azithromycin

Take on Empty Stomach (food ↓ absorption):

- Ampicillin
- Tetracyclines (except doxycycline)

No significant food effect:

- Amoxicillin
- Cephalexin
- Doxycycline

Practical Application Framework

When prescribing, systematically consider:

1. Route selection: Does oral bioavailability support outpatient therapy?
2. Site of infection: Will the antibiotic penetrate adequately?
3. Patient factors: Kidney/liver function, age, other medications
4. Dosing optimization: Time vs. concentration-dependent killing
5. Administration instructions: Food effects, spacing from other medications

Example Decision Tree:

- Patient with osteomyelitis + kidney disease + taking warfarin
- Need bone-penetrating antibiotic (clindamycin or fluoroquinolone)
- Clindamycin: no renal adjustment needed, minimal warfarin interaction
- Fluoroquinolone: requires renal adjustment, moderate warfarin interaction
- ***Choice:*** Clindamycin likely safer in this scenario

Understanding these pharmacological principles transforms prescribing from guesswork into systematic decision-making. You'll make fewer errors, achieve better therapeutic outcomes, and prescribe with greater confidence when you understand how drugs behave in the body.

The exercises that follow will help you apply these concepts in realistic clinical scenarios, building the practical skills that distinguish competent from exceptional prescribers.

Targeted Exercises

Now it's time to put your knowledge to work. These exercises aren't abstract academic problems—they mirror the real decisions you make when standing at a patient's bedside or reviewing cases. Each scenario builds on the concepts we've covered while introducing the kind of complexity you encounter in actual practice. Focus on understanding the reasoning behind each answer, not just identifying the correct choice.

Exercise 1: Basic Drug Classification

A 25-year-old presents with cellulitis. You're considering cephalexin, azithromycin, or ciprofloxacin. Which antibiotic class does each represent?

Answer:

- Cephalexin: Beta-lactam (first-generation cephalosporin)
- Azithromycin: Macrolide
- Ciprofloxacin: Fluoroquinolone

Why this matters: Understanding drug classes helps predict spectrum, side effects, and resistance patterns.

Exercise 2: Mechanism-Based Selection

Patient with suspected intracellular pathogen (Chlamydia pneumoniae). Which mechanism of action would be most effective?

A) Cell wall synthesis inhibition

B) Protein synthesis inhibition

C) DNA replication interference

D) Both B and C

Answer: D) Both B and C

Explanation: Intracellular pathogens require antibiotics that penetrate cells well. Protein synthesis inhibitors (macrolides, tetracyclines) and DNA interference agents (fluoroquinolones) both achieve excellent intracellular penetration, while cell wall inhibitors work poorly inside cells.

Exercise 3: Bioavailability Decision

Patient with severe pneumonia is improving on IV levofloxacin. Insurance wants you to switch to oral therapy. Is this clinically appropriate?

Answer: Yes, clinically appropriate.

Explanation: Levofloxacin has >95% oral bioavailability, achieving nearly identical blood levels whether given IV or PO. Switch is safe if patient can take oral medications and absorb them normally.

Exercise 4: Tissue Penetration Challenge

45-year-old male with chronic prostatitis needs oral antibiotic therapy. Which has the best prostate penetration?

A) Amoxicillin

B) Cephalexin

C) Ciprofloxacin

D) Azithromycin

Answer: C) Ciprofloxacin

Explanation: Fluoroquinolones achieve excellent prostate tissue penetration. Beta-lactams (amoxicillin, cephalexin) penetrate poorly into prostate tissue.

Exercise 5: Renal Dosing Adjustment

Elderly patient with CrCl 30 mL/min needs antibiotic for UTI. Which requires dose adjustment?

A) Doxycycline

B) Ciprofloxacin

C) Both

D) Neither

Answer: B) Ciprofloxacin

Explanation: Ciprofloxacin is renally eliminated and requires dose reduction in kidney disease. Doxycycline has

dual elimination (hepatic and renal) and typically doesn't require renal dose adjustment.

Exercise 6: Drug Interaction Recognition

Patient on warfarin develops skin infection. Which antibiotic has the highest bleeding risk?

A) Cephalexin

B) Clindamycin

C) Metronidazole

D) Doxycycline

Answer: C) Metronidazole

Explanation: Metronidazole has a major interaction with warfarin, significantly increasing bleeding risk. Close INR monitoring required.

Exercise 7: Time vs. Concentration-Dependent Killing

Patient with severe pneumonia on ceftriaxone. To optimize killing, you should focus on:

A) Achieving high peak levels

B) Maintaining levels above MIC for extended time

C) Once-daily dosing

D) Post-antibiotic effect

Answer: B) Maintaining levels above MIC for extended time

Explanation: Beta-lactams exhibit time-dependent killing. Effectiveness depends on time above minimum inhibitory concentration, not peak levels.

Exercise 8: Food Effect Application

Patient prescribed doxycycline asks about taking it with breakfast (milk, cereal). Your advice?

Answer: Take on empty stomach or at least 2 hours away from dairy products.

Explanation: Doxycycline absorption is significantly reduced by calcium in dairy products. Unlike some tetracyclines, doxycycline can be taken with non-dairy food.

Exercise 9: Spectrum Matching

Patient with suspected MRSA skin infection. Which oral antibiotic provides MRSA coverage?

A) Cephalexin

B) Amoxicillin/clavulanate

C) Clindamycin

D) Azithromycin

Answer: C) Clindamycin

Explanation: Among oral options, clindamycin provides reliable MRSA coverage for skin/soft tissue infections. Beta-lactams don't cover MRSA.

Exercise 10: Mechanism and Resistance

Why doesn't penicillin work against Mycoplasma pneumonia?

Answer: Mycoplasma lacks a cell wall.

Explanation: Penicillin works by inhibiting cell wall synthesis. Mycoplasma organisms lack traditional peptidoglycan cell walls, making beta-lactams ineffective regardless of dose.

Clinical Pearl: These exercises demonstrate that antibiotic selection involves much more than matching bugs to drugs. Optimal prescribing requires integrating patient factors, drug properties, and clinical context into systematic decision-making.

The pattern recognition you're building here will serve you throughout your career, helping you make confident prescribing decisions even in complex or unfamiliar situations.

CHAPTER 2: COMMON PITFALLS & MISCONCEPTIONS

Frequent Prescribing Errors

Even experienced clinicians fall into predictable traps when prescribing antibiotics. These aren't knowledge gaps—they're cognitive errors that occur under pressure, fatigue, or uncertainty. Recognizing these patterns helps you avoid them and develop more systematic prescribing habits.

1. The "Bigger Hammer" Fallacy

The error: Automatically choosing broader spectrum antibiotics when uncertain about diagnosis. A patient with pneumonia gets vancomycin plus piperacillin-tazobactam instead of standard community-acquired pneumonia treatment. This happens because of fear of missing resistant organisms and misunderstanding that broader equals better. The fix is starting with evidence-based first-line therapy unless specific risk factors justify broader coverage. Most infections are caused by predictable organisms—broad spectrum "just in case" drives resistance without improving outcomes.

2. Duration Drift

The error: Treating longer than necessary "to be safe." Common examples include 10-14 days for uncomplicated UTI (should be 3-5 days) or continuing antibiotics until discharge regardless of treatment duration. This happens due to arbitrary round numbers and fear that stopping "too

early" causes relapse. Base duration on evidence and clinical response, not calendar convenience. Longer treatment doesn't equal better treatment—it often means more side effects and resistance.

3. Allergy Overreaction

The error: Avoiding entire antibiotic classes for mild, non-allergic reactions. A patient with "penicillin allergy" (actually GI upset from childhood) never receives beta-lactams. The fix is clarifying allergy history: rash, anaphylaxis, or GI upset? Consider allergy testing for suspected non-allergic reactions. Over 90% of patients labeled "penicillin allergic" can actually tolerate penicillin safely.

4. IV Addiction

The error: Continuing IV antibiotics when oral would be equally effective. A patient improving on IV ceftriaxone continues IV therapy until discharge instead of switching to oral. This happens due to assumptions that IV is always better and unfamiliarity with oral bioavailability. Learn which antibiotics have excellent oral bioavailability (fluoroquinolones, clindamycin, doxycycline). Early oral switch reduces costs, shortens stays, and prevents line complications.

5. Culture Confusion

The error: Treating colonization or contamination as infection. Common scenarios include treating positive urine culture in asymptomatic elderly patients or changing antibiotics for every organism grown from respiratory cultures. Remember the distinction: infection requires clinical signs plus positive culture, while colonization shows positive culture without clinical signs. Treat patients, not culture results.

6. Prophylaxis Prolongation

The error: Continuing surgical prophylaxis beyond 24 hours. Post-operative patients receive cefazolin for 3-5 days "to prevent infection." Evidence shows prophylaxis beyond 24 hours doesn't reduce infection rates but increases resistance and C. diff risk. Stop prophylaxis within 24 hours unless specific clinical indication exists.

7. Double Coverage Redundancy

The error: Using multiple antibiotics with overlapping coverage. Patients receive both clindamycin and metronidazole for anaerobic coverage. This happens due to unfamiliarity with spectrum overlap and additive mentality. Understand each antibiotic's spectrum to avoid unnecessary duplication.

8. Fever Phobia

The error: Changing antibiotics for persistent fever without considering non-infectious causes. A patient with pneumonia on appropriate antibiotics develops fever on day 3 and gets switched to broader agents. Consider drug fever, non-infectious inflammation, viral superinfection, or normal inflammatory response first. Investigate fever causes systematically before assuming antibiotic failure.

9. Dosing Disasters

Common errors include using "standard" doses without weight/renal adjustment, once-daily dosing for time-dependent antibiotics in severe infections, and underdosing obese patients. Always check weight-based dosing, adjust for renal/hepatic function, and consider infection severity in dosing decisions.

10. Stewardship Shortcuts

The error: Ignoring local antibiograms and resistance patterns. Prescribing fluoroquinolones for UTI in areas with high fluoroquinolone resistance happens due to unfamiliarity with institutional resistance data. Know your institution's antibiogram and adjust empiric choices accordingly.

Quick Self-Check Questions

Before prescribing, ask yourself: Am I using the narrowest effective spectrum? Do I have a clear stop date based on evidence? Could oral therapy be equally effective? Have I adjusted for weight, age, and organ function? Is this a true allergy or adverse reaction? Am I treating infection or colonization?

Good antibiotic prescribing isn't about memorizing drug facts—it's about developing systematic thinking patterns that help you avoid predictable errors while optimizing patient care.

Essential Principles of Antibiotic Stewardship

Antibiotic stewardship isn't just an administrative buzzword—it's a fundamental responsibility that affects every prescribing decision you make. Every time you write for an antibiotic, you're not just treating one patient; you're influencing resistance patterns, healthcare costs, and the effectiveness of these drugs for future patients. Understanding stewardship principles helps you balance individual patient care with broader public health responsibilities.

The Core Philosophy

Stewardship means using the right antibiotic, at the right dose, for the right duration, for the right indication. It's not about withholding necessary treatment—it's about optimizing treatment to achieve the best outcomes while preserving antibiotic effectiveness. Good stewardship often leads to better patient outcomes, not worse ones.

Right Drug Selection

Choose the narrowest spectrum antibiotic that effectively treats the likely pathogens. A patient with uncomplicated cellulitis needs cephalexin, not vancomycin plus piperacillin-tazobactam. This targeted approach reduces collateral damage to normal flora, decreases resistance pressure, and minimizes side effects. Broad spectrum antibiotics should be reserved for genuinely complex cases or when narrower agents have failed.

Local resistance patterns should guide your empiric choices. If your institution's E. coli shows 30% fluoroquinolone resistance, choose a different first-line agent for UTI treatment. National guidelines provide starting points, but local data determines optimal therapy. Review your institution's antibiogram regularly and adjust prescribing patterns accordingly.

Right Dosing

Optimal dosing achieves therapeutic levels without causing toxicity. Underdosing promotes resistance by exposing bacteria to sublethal concentrations. Overdosing increases toxicity risk without improving efficacy. Weight-based dosing, renal adjustments, and infection severity all influence optimal dose selection.

For time-dependent antibiotics like beta-lactams, maintaining levels above the minimum inhibitory

concentration matters more than achieving high peaks. For concentration-dependent antibiotics like fluoroquinolones, higher peaks improve bacterial killing and reduce resistance development.

Right Duration

Shorter courses often work as well as longer ones while reducing resistance, side effects, and costs. Uncomplicated UTIs need 3-5 days of treatment, not 7-10 days. Simple cellulitis typically resolves with 5-7 days of therapy. The evidence increasingly supports shorter durations for many common infections.

Base treatment duration on clinical response and evidence-based guidelines, not arbitrary calendar periods. A patient whose cellulitis has completely resolved after 5 days doesn't need to continue antibiotics to complete a "10-day course." Conversely, slow-responding infections might require longer treatment than standard recommendations.

Right Indication

Antibiotics only work against bacterial infections. Viral respiratory illnesses, asymptomatic bacteriuria in most patients, and colonization don't require antibiotic treatment. The pressure to "do something" for sick patients can lead to inappropriate prescribing, but antibiotics won't help viral illnesses and may cause harm.

Distinguish between infection, colonization, and contamination when interpreting cultures. A positive wound culture from a healing surgical site without clinical signs of infection likely represents colonization. Treating colonization with antibiotics doesn't improve outcomes but does increase resistance and side effect risks.

De-escalation Strategies

Start with appropriate empiric therapy, then narrow or discontinue antibiotics based on clinical response and culture results. If blood cultures are negative after 48-72 hours in a patient responding to treatment, consider stopping antibiotics for presumed viral illness. When cultures identify specific organisms, switch from broad-spectrum empiric therapy to targeted treatment.

De-escalation requires confidence and systematic thinking. Many clinicians fear that narrowing antibiotic coverage will cause treatment failure, but evidence shows that appropriate de-escalation improves outcomes while reducing resistance and toxicity.

Diagnostic Stewardship

Order cultures and diagnostic tests strategically to guide therapy. Obtain blood cultures before starting antibiotics when bacteremia is suspected. Urine cultures are unnecessary for uncomplicated cystitis in young women but essential for pyelonephritis or complicated UTIs.

Rapid diagnostic tests can guide early therapy decisions. Respiratory viral panels help distinguish bacterial from viral pneumonia. Procalcitonin levels may help identify patients who don't need antibiotics for respiratory illnesses.

IV to Oral Conversion

Switch to oral antibiotics when patients can take medications by mouth and absorb them normally. Many antibiotics achieve excellent oral bioavailability—continuing IV therapy adds cost, complications, and length of stay without clinical benefit.

Create automatic conversion protocols for antibiotics with high oral bioavailability. Patients on IV fluoroquinolones,

clindamycin, or doxycycline can usually switch to oral therapy once clinically stable.

Combination Therapy Principles

Use combination antibiotics only when specifically indicated. Appropriate indications include empiric therapy for seriously ill patients when pathogen is unknown, treatment of polymicrobial infections, and prevention of resistance development for certain organisms.

Avoid combination therapy for convenience or uncertainty. Two antibiotics with overlapping spectra don't provide better coverage than one appropriate agent. Combination therapy increases costs, side effects, and resistance pressure without improving outcomes in most situations.

Prophylaxis Guidelines

Surgical prophylaxis should be limited to specific procedures with high infection risk. Give the first dose within one hour before incision (two hours for vancomycin) and discontinue within 24 hours for most procedures. Prolonged prophylaxis doesn't reduce infection rates but does increase resistance and C. diff risk.

Medical prophylaxis has limited indications. Close contacts of meningococcal disease need prophylaxis, but most patients don't require antibiotics to prevent infection during medical procedures.

Practical Implementation

Build stewardship principles into your daily workflow. Before prescribing, ask: Is this bacterial? What's the likely pathogen? What's the narrowest effective spectrum? How long should I treat? Can I use oral therapy?

Participate in antimicrobial stewardship programs at your institution. These multidisciplinary teams provide guidance, feedback, and education to optimize antibiotic use. View stewardship consultations as learning opportunities, not criticisms of your prescribing.

Monitor your own prescribing patterns. Are you using broad-spectrum antibiotics more often than necessary? Do your treatment durations align with current evidence? Are you obtaining appropriate cultures before starting therapy?

The goal of stewardship isn't to restrict antibiotic use—it's to optimize use for better patient outcomes and preserved antibiotic effectiveness. Good stewardship practices often lead to simpler, safer, more effective treatment regimens that benefit both individual patients and the broader community.

Antibiotic Allergy Misconceptions

Antibiotic allergies are among the most overdiagnosed conditions in medicine, with profound implications for patient care. Studies consistently show that over 90% of patients labeled as "penicillin allergic" can actually tolerate penicillin safely. These mislabeled allergies lead to broader spectrum antibiotic use, increased costs, worse outcomes, and higher rates of resistant infections. Understanding true versus perceived allergies is crucial for optimal prescribing.

The Scale of the Problem

Approximately 10% of the population carries a "penicillin allergy" label, but only 1-2% have true penicillin allergies. This means roughly 8% of patients are unnecessarily avoiding the safest, most effective antibiotics for many

common infections. The consequences extend far beyond individual patients—widespread penicillin avoidance contributes to increased MRSA infections, C. difficile colitis, and healthcare-associated infections.

True Allergies vs. Adverse Reactions

True allergic reactions involve immune system activation and include urticaria (hives), angioedema (swelling), bronchospasm, or anaphylaxis. These reactions typically occur within minutes to hours of drug administration and can be life-threatening. Patients with true penicillin allergies have specific IgE antibodies that trigger immediate hypersensitivity reactions.

Adverse reactions, while unpleasant, don't involve immune system activation. Common examples include gastrointestinal upset (nausea, diarrhea), headaches, or non-allergic rashes. A patient who developed stomach upset from amoxicillin as a child doesn't have a penicillin allergy—they experienced a common side effect that's unlikely to recur with appropriate dosing and food intake.

The Childhood Allergy Myth

Many adult "penicillin allergies" stem from childhood reactions that were likely viral rashes coincidentally occurring during antibiotic treatment. Children with febrile illnesses often develop rashes as part of their viral syndrome, not from the prescribed antibiotic. Additionally, even true penicillin allergies often fade over time—studies show that 80% of patients with documented penicillin allergies lose their sensitivity after 10 years.

Family History Confusion

Penicillin allergies aren't inherited. A family history of penicillin allergy doesn't increase an individual's risk of

allergic reactions. Many patients avoid penicillins because a parent or sibling has a reported allergy, but this precaution is unnecessary and potentially harmful.

Cross-Reactivity Overestimation

The traditional teaching that penicillin-allergic patients should avoid all beta-lactams has been largely disproven. Cross-reactivity between penicillins and cephalosporins is less than 2%, much lower than previously thought. Even patients with true penicillin allergies can usually receive cephalosporins safely, especially second and third-generation agents.

Cross-reactivity risk is highest with first-generation cephalosporins due to similar side chains, but even this risk is minimal. The old "10% cross-reactivity rule" between penicillins and cephalosporins has been thoroughly debunked by modern research.

Taking a Better Allergy History

When a patient reports penicillin allergy, ask specific questions: What exactly happened? When did it occur? How long after taking the medication? Did you require emergency treatment? What was the reaction—rash, breathing problems, swelling, or stomach upset?

Red flag symptoms suggesting true allergy include difficulty breathing, facial swelling, widespread hives, or emergency department visits. Non-allergic reactions typically involve isolated gastrointestinal symptoms, mild localized rashes, or general malaise.

The "Sulfa" Allergy Problem

"Sulfa allergies" represent another area of confusion. True sulfonamide allergies involve antimicrobial sulfonamides like trimethoprim-sulfamethoxazole. These don't cross-react with other sulfur-containing drugs like furosemide or sulfonylureas. Patients with sulfonamide allergies can safely receive these other medications.

Many reported "sulfa allergies" actually represent reactions to trimethoprim rather than sulfamethoxazole, or they're non-allergic adverse reactions like nausea or headache.

Penicillin Allergy Testing

Penicillin allergy testing can clarify true allergy status in appropriate patients. The testing involves skin testing followed by graded oral challenge in patients with negative skin tests. This process can safely remove inappropriate allergy labels and restore access to first-line antibiotics.

Testing is particularly valuable for patients requiring frequent antibiotics, those with recurrent infections, or patients needing specific procedures where penicillins would be preferred therapy.

Clinical Decision-Making

For patients with unclear penicillin allergy histories, consider the clinical scenario. A patient with life-threatening endocarditis might receive penicillin even with a questionable allergy history, while someone with uncomplicated cellulitis could receive alternative therapy.

When penicillin allergy seems unlikely based on history but you're uncertain, consider cephalosporins as a reasonable alternative. The cross-reactivity risk is minimal, and these agents often provide excellent coverage for the intended infection.

Alternative Antibiotics for True Allergies

Patients with documented true penicillin allergies have many effective alternatives. For streptococcal infections, macrolides, clindamycin, or fluoroquinolones work well. For skin and soft tissue infections, clindamycin, doxycycline, or trimethoprim-sulfamethoxazole provide good alternatives.

The key is choosing alternatives based on the specific infection and pathogen, not defaulting to broad-spectrum agents simply because penicillin is unavailable.

Documentation and Communication

When you determine that a patient doesn't have a true penicillin allergy, document this clearly in their medical record. Note the specific reaction described and your assessment that it doesn't represent a true allergy. This documentation helps future providers make informed prescribing decisions.

Educate patients about the difference between allergies and side effects. Many patients appreciate learning that they can safely receive penicillins, as this expands their treatment options and may improve future care.

Systematic Approach

Develop a systematic approach to allergy assessment: clarify the reaction type, timing, and severity; distinguish allergies from adverse reactions; consider allergy testing for unclear cases; choose appropriate alternatives when true allergies exist; and document your assessment clearly.

Remember that inappropriately broad allergy labels harm patients by limiting treatment options and promoting resistant infections. Taking time to clarify allergy histories

improves individual patient care while supporting broader antimicrobial stewardship goals.

Understanding antibiotic allergies helps you make more informed prescribing decisions, improve patient outcomes, and preserve the effectiveness of first-line antibiotics for appropriate patients.

SECTION II: SYSTEM-BASED CLINICAL CONDITIONS

This is where theory meets practice. You've mastered the fundamental principles, understood common pitfalls, and learned essential stewardship concepts. Now it's time to apply this knowledge to the real clinical scenarios you encounter daily. This section organizes infectious conditions by anatomical system, mirroring how you actually think about patients in clinical practice.

When a patient presents with fever and cough, you're not immediately thinking about drug mechanisms or pharmacokinetics—you're considering respiratory tract infections and their likely pathogens. When someone comes in with dysuria and frequency, your mind jumps to genitourinary causes. This section follows that natural clinical reasoning pattern, helping you build systematic approaches to common infectious presentations.

Each condition follows a consistent format designed for rapid reference and practical application. You'll find the essential clinical information presented clearly and concisely, followed by targeted exercises that reinforce key concepts. These aren't abstract academic problems—they're scenarios drawn from real clinical encounters that reflect the complexity and decision-making challenges you face daily.

The exercises within each condition are carefully designed to build different aspects of prescribing competence. Some focus on initial drug selection, others on dosing calculations or duration decisions. Many scenarios include complicating factors like allergies, organ dysfunction, or treatment failure—the real-world complexities that make prescribing both challenging and interesting.

Pay attention to the clinical pearls scattered throughout each section. These insights come from experienced clinicians who've learned through years of practice how to navigate common challenges and avoid frequent mistakes. While guidelines provide the scientific foundation, these practical tips help you implement that knowledge effectively in complex clinical situations.

The system-based organization also helps you understand how anatomical location influences antibiotic choice. Drugs that work well for skin infections might not penetrate adequately into bone or cerebrospinal fluid. Understanding these relationships helps you think more systematically about drug selection beyond simple spectrum matching.

As you work through these sections, notice how the same principles apply across different conditions. The systematic thinking you develop for respiratory infections will serve you well when treating genitourinary or skin and soft tissue infections. The goal isn't to memorize specific protocols for each condition, but to develop flexible reasoning skills that adapt to any clinical scenario.

Remember that infectious diseases don't always present in textbook fashion. Patients may have atypical symptoms, unusual pathogens, or complicating medical conditions that

influence your prescribing decisions. The exercises help prepare you for this clinical reality by presenting varied scenarios that require careful thinking rather than reflexive responses.

Each section builds on previous learning while introducing new concepts and challenges. Early sections focus on more straightforward conditions, while later sections tackle complex scenarios involving special populations or unusual pathogens. This progression mirrors how clinical expertise develops—from pattern recognition in simple cases to sophisticated reasoning in complex situations.

Use this section as both a learning tool and a reference resource. Work through the exercises systematically to build your skills, then return to specific conditions when you encounter similar patients in practice. The combination of structured learning and practical reference makes this section valuable throughout your clinical career.

The 1000+ exercises distributed across these conditions represent the core of your antibiotic prescribing education. Each exercise is designed to strengthen different aspects of clinical decision-making, from basic drug selection to complex problem-solving in challenging scenarios. Focus on understanding the reasoning behind each answer—this deeper understanding will serve you far better than memorizing specific responses.

CHAPTER 3: BONE & JOINT INFECTIONS

Discitis/Vertebral Osteomyelitis

Discitis/vertebral osteomyelitis is a serious infection of the intervertebral disc space and adjacent vertebrae that requires prolonged antibiotic therapy. Most cases result from hematogenous spread, with back pain being the most common presenting symptom. Early diagnosis and appropriate antimicrobial therapy are crucial to prevent neurological complications and chronic pain.

Common Pathogens

- Staphylococcus aureus (most common, including MRSA)
- Coagulase-negative staphylococci
- Streptococcus species
- Enterococcus species
- Gram-negative bacilli (E. coli, Pseudomonas, Proteus)
- Mycobacterium tuberculosis (especially in endemic areas)
- Brucella species (in endemic regions)

Antibiotic Choices

1. Empiric Therapy

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q24H

- Alternative: Vancomycin PLUS cefepime 2g IV Q8H

Second-line:

- Daptomycin 8-10mg/kg IV Q24H PLUS ceftriaxone 2g IV Q24H
- Linezolid 600mg IV/PO Q12H PLUS ceftriaxone 2g IV Q24H

2. Targeted Therapy (Culture-Directed)

MSSA:

- Nafcillin 2g IV Q4H or cefazolin 2g IV Q8H

MRSA:

- Vancomycin 15-20mg/kg IV Q8-12H
- Daptomycin 8-10mg/kg IV Q24H
- Linezolid 600mg IV/PO Q12H

Gram-negative:

- Based on susceptibilities (fluoroquinolones, ceftriaxone, or carbapenems)

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Ceftriaxone	2g	100mg/kg/day	Q24H
Nafcillin	2g	200mg/kg/day	Q4H

Daptomycin	8-10mg/kg	8-10mg/kg	Q24H
Cefepime	2g	150mg/kg/day	Q8H

2. Oral Antibiotics (Step-down therapy)

Drug	Adult Dose	Pediatric Dose	Frequency
Linezolid	600mg	30mg/kg/day	Q12H
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Clindamycin	600-900mg	40mg/kg/day	Q8H
Doxycycline	100mg	4mg/kg/day	Q12H

3. Renal Adjustments

- Vancomycin: Dose based on levels and CrCl
- Ceftriaxone: No adjustment needed unless CrCl <10
- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Linezolid: No adjustment needed

Organism Coverage

- Vancomycin: MRSA, MSSA, Streptococci, Enterococci
- Ceftriaxone: MSSA, Streptococci, most gram-negatives
- Nafcillin: MSSA, Streptococci (no MRSA)
- Daptomycin: MRSA, MSSA, Enterococci, Streptococci
- Linezolid: MRSA, MSSA, Streptococci, Enterococci
- Ciprofloxacin: Some gram-positives, excellent gram-negative coverage

Contraindications

- Vancomycin: Red man syndrome history (relative)
- Daptomycin: Pulmonary eosinophilia history
- Linezolid: MAO inhibitor use, uncontrolled hypertension
- Ciprofloxacin: Tendon rupture history, myasthenia gravis
- Ceftriaxone: Severe penicillin allergy

Adverse Effects

- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Daptomycin: Myopathy, pulmonary eosinophilia
- Linezolid: Thrombocytopenia, peripheral neuropathy, serotonin syndrome
- Ciprofloxacin: Tendon rupture, QT prolongation, CNS effects
- Ceftriaxone: Allergic reactions, C. diff colitis

Drug Interactions

- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Daptomycin: HMG-CoA reductase inhibitors (↑ myopathy risk)
- Linezolid: SSRIs, tyramine-rich foods (serotonin syndrome)
- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Ceftriaxone: Minimal significant interactions

Treatment Duration

- Total therapy: 6-12 weeks minimum
- IV therapy: 2-6 weeks (until clinical improvement)
- Oral step-down: 4-6 weeks to complete course
- Monitoring: Weekly ESR/CRP to guide duration
- Surgical cases: May require longer therapy

PRACTICAL EXERCISES

Exercise 1: Initial Drug Selection

A 65-year-old diabetic presents with 3 weeks of back pain and fever. MRI shows L4-L5 discitis. Blood cultures pending. What empiric antibiotic regimen would you start?

Exercise 2: MRSA-Positive Culture

Same patient's blood cultures grow MRSA. What targeted therapy would you choose?

Exercise 3: Dosing Calculation

A 80kg patient needs vancomycin for vertebral osteomyelitis. Calculate the appropriate dose.

Exercise 4: Step-down Therapy

Patient improving on IV vancomycin after 4 weeks. CRP decreased from 150 to 45. Ready for oral therapy. Best choice?

Exercise 5: Duration Decision

Patient completed 6 weeks total therapy (4 weeks IV + 2 weeks oral). CRP normalized. ESR still elevated at 40. Continue treatment?

Exercise 6: Renal Adjustment

Patient with CrCl 25 needs vancomycin for vertebral osteomyelitis. How do you adjust dosing?

Exercise 7: Drug Interaction

Patient on warfarin develops vertebral osteomyelitis. Blood cultures grow gram-negative rods sensitive to ciprofloxacin. What precaution is needed?

Exercise 8: Contraindication Recognition

Patient with vertebral osteomyelitis has history of tendon rupture with fluoroquinolones. Blood cultures grow Pseudomonas. Alternative oral option?

Exercise 9: Adverse Effect Management

Patient on linezolid for 6 weeks develops thrombocytopenia (platelets 50,000). Next step?

Exercise 10: Treatment Failure

Patient with MSSA vertebral osteomyelitis not improving after 4 weeks of appropriate nafcillin therapy. Next step?

Exercise 11: Pediatric Dosing

A 30kg child with vertebral osteomyelitis needs ceftriaxone. Calculate the daily dose.

Exercise 12: Organism Coverage

Patient with vertebral osteomyelitis grows Enterococcus faecium resistant to vancomycin (VRE). Which antibiotic provides coverage?

Clinical Pearl: Always obtain blood cultures before starting antibiotics in suspected vertebral osteomyelitis. The

bacteremia detection rate is 60-80%, and culture-directed therapy significantly improves outcomes compared to empiric treatment throughout the entire course.

Infectious Tenosynovitis

Infectious tenosynovitis is a surgical emergency involving infection of the tendon sheath, most commonly in the hand and fingers. Classic Kanavel's signs include fusiform swelling, flexed posture, tenderness over tendon sheath, and pain with passive extension. Early recognition and aggressive treatment are essential to prevent permanent functional loss.

Common Pathogens

- Staphylococcus aureus (most common, including MRSA)
- Streptococcus pyogenes (Group A Strep)
- Coagulase-negative staphylococci
- Eikenella corrodens (human bite wounds)
- Pasteurella multocida (animal bite wounds)
- Neisseria gonorrhoeae (disseminated gonococcal infection)
- Gram-negative bacilli (immunocompromised patients)
- Anaerobes (polymicrobial infections)

Antibiotic Choices

1. Empiric Therapy

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q24H

- Alternative: Clindamycin 600-900mg IV Q8H PLUS ciprofloxacin 400mg IV Q12H

Second-line:

- Daptomycin 6mg/kg IV Q24H PLUS ceftriaxone 2g IV Q24H
- Piperacillin-tazobactam 4.5g IV Q6H

2. Targeted Therapy (Culture-Directed)

MSSA:

- Nafcillin 2g IV Q4H or cefazolin 2g IV Q8H

MRSA:

- Vancomycin 15-20mg/kg IV Q8-12H
- Clindamycin 600-900mg IV Q8H
- Daptomycin 6mg/kg IV Q24H

Streptococcus:

- Penicillin G 4 million units IV Q4H
- Ceftriaxone 2g IV Q24H

3. Special Scenarios

- Human bite: Amoxicillin-clavulanate 875/125mg PO TID
- Animal bite: Amoxicillin-clavulanate 875/125mg PO TID
- Gonococcal: Ceftriaxone 1g IV Q24H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Ceftriaxone	2g	100mg/kg/day	Q24H
Nafcillin	2g	200mg/kg/day	Q4H
Clindamycin	600-900mg	40mg/kg/day	Q8H
Daptomycin	6mg/kg	8-10mg/kg	Q24H
Cefazolin	2g	100mg/kg/day	Q8H

2. Oral Antibiotics (Step-down therapy)

Drug	Adult Dose	Pediatric Dose	Frequency
Clindamycin	300-450mg	30mg/kg/day	QID
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	TID
Ciprofloxacin	500-750mg	30mg/kg/day	Q12H
Doxycycline	100mg	4mg/kg/day	Q12H
Linezolid	600mg	30mg/kg/day	Q12H

3. Renal Adjustments

- Vancomycin: Dose based on levels and CrCl
- Ceftriaxone: No adjustment unless CrCl <10
- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Daptomycin: Dose Q48H if CrCl <30

Organism Coverage

- Vancomycin: MRSA, MSSA, Streptococci, Enterococci

- Ceftriaxone: MSSA, Streptococci, most gram-negatives, gonococci
- Clindamycin: MSSA, Streptococci, anaerobes, some MRSA
- Nafcillin: MSSA, Streptococci (no MRSA)
- Amoxicillin-clavulanate: MSSA, Streptococci, anaerobes, Eikenella, Pasteurella
- Daptomycin: MRSA, MSSA, Streptococci, Enterococci

Contraindications

- Vancomycin: Red man syndrome history (relative)
- Clindamycin: Previous C. diff infection (relative)
- Ciprofloxacin: Tendon rupture history, myasthenia gravis
- Daptomycin: Pulmonary eosinophilia history
- Amoxicillin-clavulanate: Severe penicillin allergy

Adverse Effects

- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Clindamycin: C. diff colitis, GI upset
- Ciprofloxacin: Tendon rupture, QT prolongation
- Daptomycin: Myopathy, pulmonary eosinophilia
- Amoxicillin-clavulanate: GI upset, allergic reactions
- Ceftriaxone: Allergic reactions, C. diff colitis

Drug Interactions

- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Clindamycin: Warfarin (↑ INR)
- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Daptomycin: HMG-CoA reductase inhibitors (↑ myopathy)
- Amoxicillin-clavulanate: Warfarin (mild ↑ INR)

Treatment Duration

- IV therapy: 2-7 days (until clinical improvement)
- Total therapy: 7-14 days

- Oral step-down: After clinical improvement and afebrile 24-48 hours
- Post-surgical: 7-10 days if adequate drainage achieved
- Complicated cases: 14-21 days total

PRACTICAL EXERCISES

Exercise 1: Initial Empiric Selection

A 35-year-old carpenter presents with acute onset finger swelling, pain with passive extension, and flexed posture after a puncture wound. What empiric antibiotic regimen would you start?

Exercise 2: Human Bite Scenario

Patient with infectious tenosynovitis from human bite wound. Which antibiotic provides optimal coverage for oral flora including Eikenella?

Exercise 3: MRSA Coverage Decision

Healthcare worker with infectious tenosynovitis and recent MRSA exposure. Blood cultures pending. Which empiric regimen includes MRSA coverage?

Exercise 4: Dosing Calculation

A 70kg patient needs vancomycin for infectious tenosynovitis. Calculate the appropriate dose.

Exercise 5: Step-down Therapy

Patient improving on IV vancomycin after 4 days. Afebrile for 48 hours, decreased swelling. Best oral step-down option for MRSA?

Exercise 6: Gonococcal Tenosynovitis

Young adult with tenosynovitis and pustular skin lesions. Synovial fluid shows gram-negative diplococci. Targeted therapy?

Exercise 7: Renal Adjustment

Patient with CrCl 20 needs daptomycin for MRSA tenosynovitis. How do you adjust dosing?

Exercise 8: Duration Decision

Patient completed surgical drainage and 10 days of antibiotics. Symptoms resolved, normal range of motion. Continue therapy?

Exercise 9: Penicillin Allergy

Patient allergic to penicillin needs treatment for streptococcal tenosynovitis. Best alternative?

Exercise 10: Treatment Failure

Patient not improving after 5 days of appropriate antibiotics and surgical drainage. Next steps?

Exercise 11: Pediatric Dosing

A 25kg child needs clindamycin for infectious tenosynovitis. Calculate the daily IV dose.

Exercise 12: Drug Interaction

Patient on warfarin develops infectious tenosynovitis. You choose clindamycin. What monitoring is needed?

Clinical Pearl: Always coordinate with hand surgery early in infectious tenosynovitis cases. Antibiotic therapy alone is often insufficient - most cases require surgical drainage within 24-48 hours to prevent permanent tendon damage and loss of function.

Open Fracture

Open fractures involve bone breaks with overlying skin disruption, creating direct communication between the fracture site and external environment. These injuries require immediate surgical intervention and antibiotic

prophylaxis to prevent osteomyelitis and soft tissue infections. The Gustilo-Anderson classification guides antibiotic selection and duration based on wound severity and contamination risk.

Common Pathogens

- Staphylococcus aureus (most common, including MRSA)
- Streptococcus pyogenes (Group A Strep)
- Coagulase-negative staphylococci
- Gram-negative bacilli (E. coli, Pseudomonas, Enterobacter)
- Anaerobes (Clostridium species, Bacteroides)
- Environmental organisms (soil, water contamination)
- Polymicrobial infections (farm injuries, heavily contaminated wounds)

Antibiotic Choices

1. Gustilo Type I (Clean, <1cm wound)

First-line:

- Cefazolin 2g IV Q8H

Second-line:

- Clindamycin 600-900mg IV Q8H (penicillin allergy)

2. Gustilo Type II (Moderate, 1-10cm wound)

First-line:

- Cefazolin 2g IV Q8H PLUS gentamicin 5-7mg/kg IV Q24H

Second-line:

- Clindamycin 600-900mg IV Q8H PLUS ciprofloxacin 400mg IV Q12H

3. Gustilo Type III (Severe, >10cm or high contamination)

First-line:

- Cefazolin 2g IV Q8H PLUS gentamicin 5-7mg/kg IV Q24H PLUS penicillin G 4 million units IV Q4H

Farmyard/High contamination:

- Piperacillin-tazobactam 4.5g IV Q6H PLUS gentamicin 5-7mg/kg IV Q24H

4. MRSA Risk Factors Present

- Add vancomycin 15-20mg/kg IV Q8-12H to above regimens

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Cefazolin	2g	100mg/kg/day	Q8H
Gentamicin	5-7mg/kg	7.5mg/kg/day	Q24H
Clindamycin	600-900mg	40mg/kg/day	Q8H
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H

Penicillin G	4 million units	250,000 units/kg/day	Q4H
Ciprofloxacin	400mg	30mg/kg/day	Q12H

2. Oral Antibiotics (Step-down therapy)

Drug	Adult Dose	Pediatric Dose	Frequency
Cephalexin	500mg	50mg/kg/day	QID
Clindamycin	300-450mg	30mg/kg/day	QID
Ciprofloxacin	500-750mg	30mg/kg/day	Q12H
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	TID
Doxycycline	100mg	4mg/kg/day	Q12H

3. Renal Adjustments

- Gentamicin: Monitor levels, adjust based on CrCl
- Vancomycin: Dose based on levels and CrCl
- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Cefazolin: Reduce dose if CrCl <35

Organism Coverage

- Cefazolin: MSSA, Streptococci, most gram-negatives
- Gentamicin: Gram-negatives, synergistic with beta-lactams
- Clindamycin: MSSA, Streptococci, anaerobes, some MRSA
- Vancomycin: MRSA, MSSA, Streptococci, Enterococci
- Penicillin G: Streptococci, Clostridium species
- Piperacillin-tazobactam: Broad spectrum including Pseudomonas

Contraindications

- Cefazolin: Severe penicillin allergy
- Gentamicin: Myasthenia gravis, severe renal disease
- Clindamycin: Previous C. diff infection (relative)
- Vancomycin: Red man syndrome history (relative)
- Ciprofloxacin: Tendon rupture history, myasthenia gravis

Adverse Effects

- Cefazolin: Allergic reactions, C. diff colitis
- Gentamicin: Nephrotoxicity, ototoxicity
- Clindamycin: C. diff colitis, GI upset
- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Penicillin G: Allergic reactions, seizures (high doses)
- Ciprofloxacin: Tendon rupture, QT prolongation

Drug Interactions

- Gentamicin: Vancomycin (↑ nephrotoxicity), loop diuretics (↑ ototoxicity)
- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Clindamycin: Warfarin (↑ INR)
- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Cefazolin: Minimal significant interactions

Treatment Duration

- Gustilo Type I: 24-48 hours prophylaxis
- Gustilo Type II: 48-72 hours prophylaxis
- Gustilo Type III: 72 hours to 5 days prophylaxis

- If infection develops: 6-8 weeks total therapy
- Oral step-down: When clinically stable and afebrile
- Heavily contaminated: May extend up to 7 days prophylaxis

PRACTICAL EXERCISES

Exercise 1: Type I Classification

A 30-year-old cyclist has a simple tibial fracture with a 0.5cm clean wound. No other injuries. What antibiotic prophylaxis would you recommend?

Exercise 2: Type III High-Risk

Farmer injured by farm equipment with severe open femur fracture, >12cm wound with soil contamination. Initial antibiotic regimen?

Exercise 3: MRSA Risk Assessment

Healthcare worker with Type II open fracture. Recent MRSA exposure documented. How do you modify antibiotic prophylaxis?

Exercise 4: Penicillin Allergy

Patient with Type II open fracture reports severe penicillin allergy (anaphylaxis). Alternative regimen?

Exercise 5: Gentamicin Dosing

A 80kg patient needs gentamicin for Type III open fracture. Calculate the appropriate dose.

Exercise 6: Duration Decision

Type I open fracture patient completed 48 hours of cefazolin. No signs of infection. Continue prophylaxis?

Exercise 7: Infection Development

Patient with Type II fracture develops fever and purulent drainage on post-op day 5. Current management?

Exercise 8: Renal Impairment

Patient with CrCl 25 needs gentamicin for open fracture. How do you adjust dosing?

Exercise 9: Step-down Therapy

Patient improving on IV cefazolin after developing post-operative infection. Ready for oral therapy. Best choice?

Exercise 10: Pediatric Dosing

A 40kg child with Type II open fracture needs cefazolin. Calculate the daily dose.

Exercise 11: Treatment Failure

Patient not improving after 7 days of appropriate antibiotics for open fracture infection. Next steps?

Exercise 12: Anaerobic Coverage

Type III open fracture with farm contamination grows Clostridium perfringens. Targeted therapy?

Clinical Pearl: Antibiotic prophylaxis for open fractures should begin within 3 hours of injury (ideally within 1 hour) and continue until definitive wound closure. The goal is prevention, not treatment—once infection develops, switch to full therapeutic doses and duration.

Osteomyelitis

Osteomyelitis is bone infection that can be acute or chronic, hematogenous or contiguous, and involves complex treatment requiring prolonged antibiotic therapy. Early diagnosis and appropriate antimicrobial selection are crucial to prevent bone destruction and chronic infection. Treatment duration typically ranges from 4-6 weeks for acute cases to 12+ weeks for chronic infections.

Common Pathogens

- Staphylococcus aureus (most common, including MRSA)
- Coagulase-negative staphylococci (prosthetic devices)
- Streptococcus species (Group A, B, viridans group)
- Enterococcus species
- Gram-negative bacilli (E. coli, Pseudomonas, Proteus)
- Salmonella species (sickle cell disease)
- Kingella kingae (children <5 years)
- Anaerobes (diabetic foot, skull base)
- Mycobacterium tuberculosis (vertebral)

Antibiotic Choices

1. Empiric Therapy - Acute Hematogenous

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q24H

Second-line:

- Daptomycin 8-10mg/kg IV Q24H PLUS ceftriaxone 2g IV Q24H

2. Empiric Therapy - Chronic/Post-surgical

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS piperacillin-tazobactam 4.5g IV Q6H

3. Targeted Therapy

MSSA:

- Nafcillin 2g IV Q4H or cefazolin 2g IV Q8H

MRSA:

- Vancomycin 15-20mg/kg IV Q8-12H
- Daptomycin 8-10mg/kg IV Q24H
- Linezolid 600mg IV/PO Q12H

Pseudomonas:

- Cefepime 2g IV Q8H or piperacillin-tazobactam 4.5g IV Q6H

4. Oral Step-down Options

MSSA:

- Cephalexin 500mg PO QID
- Clindamycin 300-450mg PO QID

MRSA:

- Linezolid 600mg PO Q12H
- Clindamycin 300-450mg PO QID (if susceptible)

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Nafcillin	2g	200mg/kg/day	Q4H
Cefazolin	2g	100mg/kg/day	Q8H
Daptomycin	8-10mg/kg	8-10mg/kg	Q24H
Ceftriaxone	2g	100mg/kg/day	Q24H
Linezolid	600mg	30mg/kg/day	Q12H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Cephalexin	500mg	50mg/kg/day	QID
Clindamycin	300-450mg	30mg/kg/day	QID
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Linezolid	600mg	30mg/kg/day	Q12H
Doxycycline	100mg	4mg/kg/day	Q12H

3. Renal Adjustments

- Vancomycin: Dose based on levels and CrCl
- Daptomycin: Dose Q48H if CrCl <30
- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Linezolid: No adjustment needed

Organism Coverage

- Vancomycin: MRSA, MSSA, Streptococci, Enterococci
- Nafcillin: MSSA, Streptococci (no MRSA)
- Daptomycin: MRSA, MSSA, Enterococci, Streptococci
- Ceftriaxone: MSSA, Streptococci, most gram-negatives
- Linezolid: MRSA, MSSA, Streptococci, Enterococci
- Ciprofloxacin: Some gram-positives, excellent gram-negative coverage

Contraindications

- Vancomycin: Red man syndrome history (relative)
- Daptomycin: Pulmonary eosinophilia history
- Linezolid: MAO inhibitor use, uncontrolled hypertension
- Ciprofloxacin: Tendon rupture history, myasthenia gravis
- Clindamycin: Previous C. diff infection (relative)

Adverse Effects

- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Daptomycin: Myopathy, pulmonary eosinophilia
- Linezolid: Thrombocytopenia, peripheral neuropathy
- Ciprofloxacin: Tendon rupture, QT prolongation
- Clindamycin: C. diff colitis, GI upset

Drug Interactions

- Vancomycin: Aminoglycosides (↑ nephrotoxicity)

- Daptomycin: HMG-CoA reductase inhibitors (↑ myopathy)
- Linezolid: SSRIs, tyramine-rich foods (serotonin syndrome)
- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Clindamycin: Warfarin (↑ INR)

Treatment Duration

- Acute hematogenous: 4-6 weeks total
- Chronic osteomyelitis: 6-12 weeks total
- Prosthetic joint infection: 12 weeks minimum
- IV therapy: 2-4 weeks (until clinical improvement)
- Oral step-down: 2-8 weeks to complete course
- Pediatric acute: 3-4 weeks total (shorter acceptable)

PRACTICAL EXERCISES

Exercise 1: Acute Hematogenous Selection

A 45-year-old diabetic presents with acute onset thigh pain and fever. MRI shows femoral osteomyelitis. Blood cultures pending. Initial empiric regimen?

Exercise 2: MRSA Treatment

Blood cultures grow MRSA from above patient. Switch to targeted therapy. Best option for 6-week course?

Exercise 3: Pediatric Acute Osteomyelitis

A 8-year-old with acute tibial osteomyelitis. Blood cultures grow MSSA. Targeted IV therapy choice?

Exercise 4: Dosing Calculation

A 70kg patient needs daptomycin for MRSA osteomyelitis. Calculate the appropriate dose.

Exercise 5: Oral Step-down

Patient improving on IV vancomycin after 3 weeks. MRSA susceptible to clindamycin. Oral option?

Exercise 6: Chronic Duration

Patient with chronic osteomyelitis completed 8 weeks therapy. Symptoms resolved, ESR normalized. Continue treatment?

Exercise 7: Renal Adjustment

Patient with CrCl 20 needs daptomycin for osteomyelitis. How do you adjust dosing?

Exercise 8: Prosthetic Joint Infection

Patient with infected knee prosthesis, planning retention. MSSA infection. Treatment duration?

Exercise 9: Drug Interaction

Patient on simvastatin needs daptomycin for osteomyelitis. What monitoring is required?

Exercise 10: Treatment Failure

Patient not improving after 4 weeks of appropriate therapy. Inflammatory markers rising. Next steps?

Exercise 11: Pseudomonas Coverage

Chronic osteomyelitis grows Pseudomonas aeruginosa. Best oral step-down option?

Exercise 12: Linezolid Monitoring

Patient on linezolid for 6 weeks develops thrombocytopenia (platelets 60,000). Management?

Clinical Pearl: Obtain tissue biopsy or bone culture whenever possible before starting antibiotics in suspected osteomyelitis. Blood cultures are positive in only 50-60% of cases, and culture-directed therapy significantly improves outcomes compared to prolonged empiric treatment.

Septic Arthritis

Septic arthritis is a joint space infection requiring emergency arthrocentesis and immediate antibiotic therapy to prevent cartilage destruction and permanent joint damage. Symptoms include acute joint pain, swelling, warmth, and limited range of motion, often with fever. Early diagnosis and treatment within 24-48 hours are critical for optimal outcomes.

Common Pathogens

- Staphylococcus aureus (most common, including MRSA)
- Streptococcus pyogenes (Group A Strep)
- Streptococcus agalactiae (Group B Strep)
- Streptococcus pneumoniae
- Neisseria gonorrhoeae (young, sexually active adults)
- Gram-negative bacilli (elderly, immunocompromised)
- Kingella kingae (children <5 years)
- Haemophilus influenzae (unvaccinated children)
- Salmonella species (sickle cell disease)

Antibiotic Choices

1. Empiric Therapy - Adults

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q24H

Second-line:

- Daptomycin 6mg/kg IV Q24H PLUS ceftriaxone 2g IV Q24H

2. Empiric Therapy - Children

First-line:

- Vancomycin 15mg/kg IV Q6H PLUS ceftriaxone 100mg/kg/day IV Q24H

3. Gonococcal Arthritis

First-line:

- Ceftriaxone 1g IV Q24H

4. Targeted Therapy

MSSA:

- Nafcillin 2g IV Q4H or cefazolin 2g IV Q8H

MRSA:

- Vancomycin 15-20mg/kg IV Q8-12H
- Daptomycin 6mg/kg IV Q24H

Streptococcus:

- Penicillin G 4 million units IV Q4H
- Ceftriaxone 2g IV Q24H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H (Q6H pediatric)
Ceftriaxone	2g	100mg/kg/day	Q24H
Nafcillin	2g	200mg/kg/day	Q4H
Daptomycin	6mg/kg	8-10mg/kg	Q24H
Cefazolin	2g	100mg/kg/day	Q8H
Penicillin G	4 million units	250,000 units/kg/day	Q4H

2. Oral Antibiotics (Step-down therapy)

Drug	Adult Dose	Pediatric Dose	Frequency
Cephalexin	500mg	50mg/kg/day	QID
Clindamycin	300-450mg	30mg/kg/day	QID
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Linezolid	600mg	30mg/kg/day	Q12H
Amoxicillin	875mg	90mg/kg/day	TID

3. Renal Adjustments

- Vancomycin: Dose based on levels and CrCl
- Daptomycin: Dose Q48H if CrCl <30
- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Ceftriaxone: No adjustment unless CrCl <10

Organism Coverage

- , excellent gram-negative coverage
- Vancomycin: MRSA, MSSA, Streptococci, Enterococci
- Ceftriaxone: MSSA, Streptococci, most gram-negatives, gonococci
- Nafcillin: MSSA, Streptococci (no MRSA)
- Daptomycin: MRSA, MSSA, Streptococci, Enterococci
- Penicillin G: Streptococci, some gram-positives
- Ciprofloxacin: Some gram-positives

Contraindications

- Vancomycin: Red man syndrome history (relative)
- Daptomycin: Pulmonary eosinophilia history
- Ciprofloxacin: Tendon rupture history, myasthenia gravis
- Clindamycin: Previous C. diff infection (relative)
- Nafcillin: Severe penicillin allergy

Adverse Effects

- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Daptomycin: Myopathy, pulmonary eosinophilia
- Ceftriaxone: Allergic reactions, C. diff colitis
- Ciprofloxacin: Tendon rupture, QT prolongation
- Clindamycin: C. diff colitis, GI upset

Drug Interactions

- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Daptomycin: HMG-CoA reductase inhibitors (↑ myopathy)
- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Clindamycin: Warfarin (↑ INR)
- Ceftriaxone: Minimal significant interactions

Treatment Duration

- IV therapy: 2-4 weeks (until clinical improvement)
- Total therapy: 3-6 weeks
- Gonococcal arthritis: 7-14 days total
- Prosthetic joint: 6-12 weeks minimum
- Oral step-down: When afebrile 48-72 hours and improving
- Pediatric: Often shorter courses (2-3 weeks total)

PRACTICAL EXERCISES

Exercise 1: Adult Empiric Selection

A 55-year-old presents with acute knee swelling, fever, and severe pain. Arthrocentesis shows 80,000 WBC, 90% neutrophils. Gram stain pending. Initial antibiotic choice?

Exercise 2: Gonococcal Arthritis

A 25-year-old sexually active female with acute wrist arthritis, tenosynovitis, and pustular skin lesions. Most likely pathogen and treatment?

Exercise 3: MRSA Targeted Therapy

Synovial fluid cultures grow MRSA. Patient clinically stable on vancomycin. Continue current therapy or switch?

Exercise 4: Pediatric Dosing

A 30kg child with septic arthritis needs vancomycin. Calculate the appropriate dose.

Exercise 5: Step-down Decision

Patient with MSSA septic arthritis improving on IV nafcillin after 2 weeks. Afebrile 72 hours. Oral options?

Exercise 6: Duration for Prosthetic

Patient with infected knee prosthesis, hardware retained. MSSA infection treated with nafcillin. Total treatment duration?

Exercise 7: Renal Impairment

Patient with CrCl 25 needs daptomycin for MRSA septic arthritis. Dosing adjustment needed?

Exercise 8: Gonococcal Duration

Patient with disseminated gonococcal infection and arthritis responding to ceftriaxone. How long to treat?

Exercise 9: Penicillin Allergy

Patient with severe penicillin allergy develops streptococcal septic arthritis. Alternative therapy?

Exercise 10: Treatment Failure

Patient not improving after 1 week of appropriate antibiotics. Joint remains swollen and painful. Next steps?

Exercise 11: Pediatric Kingella

A 3-year-old with hip arthritis. Synovial fluid grows Kingella kingae. Targeted therapy?

Exercise 12: Drug Monitoring

Patient on daptomycin for 3 weeks complains of muscle pain and weakness. What laboratory test is needed?

Clinical Pearl: Always perform arthrocentesis before starting antibiotics in suspected septic arthritis. Synovial fluid analysis (cell count, gram stain, culture) is essential for diagnosis and guiding therapy—blood cultures are positive in only 50-70% of cases.

Septic Bursitis

Septic bursitis is infection of the bursal sac, most commonly affecting superficial bursae (olecranon, prepatellar). It typically follows trauma or repeated pressure and presents with localized swelling, warmth, erythema, and fluctuance over the bursa. Unlike septic arthritis, joint range of motion is usually preserved unless infection spreads to adjacent structures.

Common Pathogens

- Staphylococcus aureus (most common, including MRSA)
- Streptococcus pyogenes (Group A Strep)
- Streptococcus agalactiae (Group B Strep)
- Coagulase-negative staphylococci
- Enterococcus species
- Gram-negative bacilli (immunocompromised patients)
- Pseudomonas aeruginosa (puncture wounds)
- Polymicrobial infections (chronic cases)

Antibiotic Choices

1. Empiric Therapy - Outpatient

First-line:

- Clindamycin 300-450mg PO QID
- Cephalexin 500mg PO QID

Second-line:

- Doxycycline 100mg PO BID
- Trimethoprim-sulfamethoxazole DS 1-2 tablets PO BID

2. Empiric Therapy - Inpatient/Severe

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H
- Clindamycin 600-900mg IV Q8H

High MRSA Risk:

- Vancomycin 15-20mg/kg IV Q8-12H

3. Targeted Therapy

MSSA:

- Cephalexin 500mg PO QID or nafcillin 2g IV Q4H

MRSA:

- Clindamycin 300-450mg PO QID (if susceptible)
- Linezolid 600mg PO Q12H
- Doxycycline 100mg PO BID

Streptococcus:

- Amoxicillin 875mg PO TID or penicillin G 4 million units IV Q4H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Clindamycin	600-900mg	40mg/kg/day	Q8H
Nafcillin	2g	200mg/kg/day	Q4H
Cefazolin	2g	100mg/kg/day	Q8H
Penicillin G	4 million units	250,000 units/kg/day	Q4H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Clindamycin	300-450mg	30mg/kg/day	QID
Cephalexin	500mg	50mg/kg/day	QID
Doxycycline	100mg	4mg/kg/day	Q12H
TMP-SMX	DS 1-2 tablets	8-12mg/kg/day (TMP)	Q12H
Linezolid	600mg	30mg/kg/day	Q12H
Amoxicillin	875mg	90mg/kg/day	TID

3. Renal Adjustments

- Vancomycin: Dose based on levels and CrCl
- TMP-SMX: Avoid if CrCl <15
- Linezolid: No adjustment needed
- Doxycycline: No adjustment needed

Organism Coverage

- Clindamycin: MSSA, Streptococci, some MRSA, anaerobes
- Cephalexin: MSSA, Streptococci (no MRSA)
- Vancomycin: MRSA, MSSA, Streptococci, Enterococci
- Doxycycline: MSSA, some MRSA, atypicals
- TMP-SMX: MSSA, some MRSA, gram-negatives
- Linezolid: MRSA, MSSA, Streptococci, Enterococci

Contraindications

- Clindamycin: Previous C. diff infection (relative)
- Doxycycline: Pregnancy, children <8 years
- TMP-SMX: Severe renal failure, folate deficiency
- Vancomycin: Red man syndrome history (relative)
- Linezolid: MAO inhibitor use

Adverse Effects

- Clindamycin: C. diff colitis, GI upset
- Doxycycline: Photosensitivity, esophagitis
- TMP-SMX: Hyperkalemia, skin reactions
- Vancomycin: Nephrotoxicity, ototoxicity
- Linezolid: Thrombocytopenia, peripheral neuropathy

Drug Interactions

- Clindamycin: Warfarin (↑ INR)
- Doxycycline: Antacids (↓ absorption), warfarin (↑ INR)
- TMP-SMX: Warfarin (↑ INR), methotrexate (↑ toxicity)
- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Linezolid: SSRIs, tyramine-rich foods

Treatment Duration

- Uncomplicated cases: 7-10 days
- MRSA infections: 7-14 days
- Severe/complicated: 10-14 days
- IV therapy: 2-5 days (until clinical improvement)
- Oral step-down: Complete course with oral agents
- Post-drainage: 5-7 days if adequate drainage

PRACTICAL EXERCISES

Exercise 1: Outpatient Empiric

A 45-year-old roofer presents with swollen, red, painful elbow bursa after falling. No fever, good range of motion. Outpatient empiric therapy?

Exercise 2: MRSA Risk Factors

Healthcare worker with olecranon bursitis and recent MRSA exposure. Which oral antibiotic provides MRSA coverage?

Exercise 3: Severe Presentation

Patient with large prepatellar bursitis, fever 101°F, spreading erythema. Requires hospitalization. IV empiric choice?

Exercise 4: Culture-Directed MSSA

Bursal fluid grows MSSA. Patient stable on oral therapy. Best targeted antibiotic?

Exercise 5: Pediatric Dosing

A 20kg child needs clindamycin for septic bursitis. Calculate the daily oral dose.

Exercise 6: Duration Decision

Patient with uncomplicated septic bursitis completed 7 days of clindamycin. Symptoms resolved. Continue treatment?

Exercise 7: Penicillin Allergy

Patient allergic to penicillin develops streptococcal bursitis. Alternative oral therapy?

Exercise 8: Renal Impairment

Patient with CrCl 10 needs antibiotic for septic bursitis. Which oral option requires no renal adjustment?

Exercise 9: Treatment Failure

Patient not improving after 5 days of appropriate oral antibiotics. Bursa remains swollen. Next step?

Exercise 10: MRSA Coverage

Bursal fluid grows MRSA resistant to clindamycin. Alternative oral options?

Exercise 11: Drug Interaction

Patient on warfarin develops septic bursitis. You prescribe clindamycin. What monitoring needed?

Exercise 12: Step-down Therapy

Patient improving on IV vancomycin after 3 days. MRSA susceptible to clindamycin. Oral transition?

Clinical Pearl: Most septic bursitis can be managed with oral antibiotics and needle aspiration/drainage. Unlike septic arthritis, surgical drainage is rarely needed unless there's concern for extension to adjacent joint or soft tissues.

CHAPTER 4: CARDIOVASCULAR INFECTIONS

Endocarditis

Endocarditis is infection of heart valves or endocardium requiring prolonged IV antibiotic therapy and careful monitoring for complications. It can be acute (rapid onset, often S. aureus) or subacute (indolent course, often viridans streptococci). Early diagnosis and appropriate antimicrobial therapy are essential to prevent valve destruction, embolic events, and mortality.

Common Pathogens

- Staphylococcus aureus (most common acute, including MRSA)
- Viridans group streptococci (subacute, abnormal valves)
- Enterococci (E. faecalis, E. faecium)
- Streptococcus gallolyticus (colon cancer association)
- HACEK organisms (Haemophilus, Aggregatibacter, Cardiobacterium)
- Coagulase-negative staphylococci (prosthetic valves)
- Streptococcus pneumoniae
- Bartonella species (culture-negative)
- Candida species (IV drug users, prosthetic valves)

Antibiotic Choices

1. Empiric Therapy - Native Valve Acute

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q24H

2. Empiric Therapy - Prosthetic Valve

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS gentamicin 3mg/kg/day IV PLUS rifampin 300mg PO Q8H

3. Targeted Therapy

MSSA:

- Nafcillin 12g/day IV continuous infusion or 2g IV Q4H

MRSA:

- Vancomycin 15-20mg/kg IV Q8-12H or daptomycin 8-10mg/kg IV Q24H

Viridans Streptococci:

- Penicillin G 18-30 million units/day IV continuous or divided Q4H

Enterococci:

- Penicillin G 18-30 million units/day IV PLUS gentamicin 3mg/kg/day IV

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Nafcillin	2g	200mg/kg/day	Q4H
Penicillin G	18-30 million units/day	300,000 units/kg/day	Continuous or Q4H
Daptomycin	8-10mg/kg	8-10mg/kg	Q24H
Gentamicin	3mg/kg/day	7.5mg/kg/day	Q24H or divided

Ceftriaxone	2g	100mg/kg/day	Q24H

2. Oral Antibiotics (Limited use)

Drug	Adult Dose	Pediatric Dose	Frequency
Rifampin	300mg	20mg/kg/day	Q8H
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Linezolid	600mg	30mg/kg/day	Q12H
Amoxicillin	1g	100mg/kg/day	Q8H

3. Renal Adjustments

- Vancomycin: Dose based on levels and CrCl
- Gentamicin: Monitor levels, adjust based on CrCl
- Penicillin G: Reduce dose if CrCl <10
- Daptomycin: Dose Q48H if CrCl <30

Organism Coverage

- Vancomycin: MRSA, MSSA, Streptococci, Enterococci
- Nafcillin: MSSA, Streptococci (no MRSA)
- Penicillin G: Streptococci, Enterococci, some gram-positives
- Daptomycin: MRSA, MSSA, Streptococci, Enterococci
- Gentamicin: Gram-negatives, synergy with cell wall agents
- Ceftriaxone: MSSA, Streptococci, HACEK organisms

Contraindications

- Vancomycin: Red man syndrome history (relative)
- Gentamicin: Myasthenia gravis, severe renal disease

- Daptomycin: Pulmonary eosinophilia history
- Nafcillin: Severe penicillin allergy
- Penicillin G: Severe penicillin allergy

Adverse Effects

- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Gentamicin: Nephrotoxicity, ototoxicity
- Daptomycin: Myopathy, pulmonary eosinophilia
- Nafcillin: Allergic reactions, interstitial nephritis
- Penicillin G: Allergic reactions, seizures (high doses)

Drug Interactions

- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Gentamicin: Vancomycin (↑ nephrotoxicity), loop diuretics
- Daptomycin: HMG-CoA reductase inhibitors (↑ myopathy)
- Rifampin: Multiple CYP450 interactions
- Penicillin G: Minimal significant interactions

Treatment Duration

- Native valve MSSA: 6 weeks IV
- Native valve MRSA: 6 weeks IV
- Native valve streptococci: 4 weeks IV (6 weeks if complicated)
- Prosthetic valve: 6-8 weeks IV minimum
- Enterococcal: 4-6 weeks IV
- Right-sided S. aureus (IVDU): 2-4 weeks IV (if uncomplicated)
- No oral step-down for most cases

PRACTICAL EXERCISES

Exercise 1: Acute Native Valve

A 55-year-old with acute onset fever, new murmur, and positive blood cultures pending. Empiric therapy for native valve endocarditis?

Exercise 2: MSSA Endocarditis

Blood cultures grow MSSA. Echocardiogram shows mitral valve vegetation. Targeted therapy choice?

Exercise 3: Prosthetic Valve Empiric

Patient with mechanical aortic valve presents with fever and positive blood cultures. Empiric regimen?

Exercise 4: Enterococcal Treatment

E. faecalis grows from blood cultures in patient with native valve endocarditis. Treatment regimen?

Exercise 5: Daptomycin Dosing

A 80kg patient needs daptomycin for MRSA endocarditis. Calculate the appropriate dose.

Exercise 6: Duration Decision

Patient with uncomplicated right-sided S. aureus endocarditis (IVDU). Minimum treatment duration?

Exercise 7: Gentamicin Monitoring

Patient receiving gentamicin for enterococcal endocarditis. What monitoring is required?

Exercise 8: Penicillin Allergy

Patient with severe penicillin allergy develops viridans streptococcal endocarditis. Alternative therapy?

Exercise 9: Renal Impairment

Patient with CrCl 20 needs vancomycin for MRSA endocarditis. Dosing considerations?

Exercise 10: Treatment Failure

Patient not improving after 2 weeks of appropriate therapy. Persistent bacteremia. Next steps?

Exercise 11: Prosthetic Valve Duration

Patient with prosthetic valve endocarditis, MSSA isolated. Minimum treatment duration?

Exercise 12: Drug Toxicity

Patient on vancomycin + gentamicin develops rising creatinine. Management approach?

Clinical Pearl: Always obtain multiple blood cultures (3 sets from different sites) before starting antibiotics in suspected endocarditis. Continuous bacteremia is a hallmark of endocarditis, and positive cultures guide targeted therapy for this serious infection requiring prolonged treatment.

CHAPTER 5: CENTRAL NERVOUS SYSTEM INFECTIONS

Bell's Palsy

Bell's palsy is acute unilateral facial nerve paralysis of unknown etiology, though viral reactivation (HSV-1) is suspected. Most cases are treated with corticosteroids alone, as antivirals show minimal benefit in most patients. Antibiotics are not routinely indicated unless secondary bacterial infection develops.

Common Pathogens

- No bacterial pathogens in typical Bell's palsy
- Secondary infection risks:
    - Staphylococcus aureus (facial cellulitis)
    - Streptococcus pyogenes (facial cellulitis)
    - Pseudomonas aeruginosa (malignant otitis externa)
- Viral associations (not treated with antibiotics):
    - Herpes simplex virus-1
    - Varicella-zoster virus
    - Epstein-Barr virus

Antibiotic Choices

1. Typical Bell's Palsy

Standard care:

- No antibiotics indicated
- Prednisone 1mg/kg/day (max 80mg) for 7-10 days

2. Secondary Bacterial Complications

Facial cellulitis:

- Cephalexin 500mg PO QID
- Clindamycin 300-450mg PO QID

Severe/hospitalized:

- Vancomycin 15-20mg/kg IV Q8-12H (if MRSA risk)
- Cefazolin 2g IV Q8H

3. Malignant Otitis Externa (rare complication)

First-line:

- Ciprofloxacin 750mg PO Q12H or 400mg IV Q12H

Standard Dosing

1. IV Antibiotics (complications only)

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Cefazolin	2g	100mg/kg/day	Q8H
Ciprofloxacin	400mg	30mg/kg/day	Q12H
Clindamycin	600-900mg	40mg/kg/day	Q8H

2. Oral Antibiotics (complications only)

Drug	Adult Dose	Pediatric Dose	Frequency
Cephalexin	500mg	50mg/kg/day	QID
Clindamycin	300-450mg	30mg/kg/day	QID
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	TID

3. Renal Adjustments

- Vancomycin: Dose based on levels and CrCl
- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Cephalexin: Reduce dose if CrCl <50
- Clindamycin: No adjustment needed

Organism Coverage

- Cephalexin: MSSA, Streptococci (no MRSA)
- Clindamycin: MSSA, Streptococci, some MRSA
- Vancomycin: MRSA, MSSA, Streptococci
- Ciprofloxacin: Pseudomonas, gram-negatives, some gram-positives
- Amoxicillin-clavulanate: MSSA, Streptococci, anaerobes

Contraindications

- Ciprofloxacin: Tendon rupture history, myasthenia gravis
- Clindamycin: Previous C. diff infection (relative)
- Vancomycin: Red man syndrome history (relative)
- Cephalexin: Severe penicillin allergy

Adverse Effects

- Ciprofloxacin: Tendon rupture, QT prolongation
- Clindamycin: C. diff colitis, GI upset
- Vancomycin: Nephrotoxicity, ototoxicity
- Cephalexin: Allergic reactions, GI upset

Drug Interactions

- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Clindamycin: Warfarin (↑ INR)
- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Amoxicillin-clavulanate: Warfarin (mild ↑ INR)

Treatment Duration

- Typical Bell's palsy: No antibiotics needed
- Facial cellulitis: 7-10 days
- Severe cellulitis: 10-14 days
- Malignant otitis externa: 4-6 weeks
- IV therapy: 3-7 days until improvement, then oral

PRACTICAL EXERCISES

Exercise 1: Typical Presentation

A 45-year-old develops sudden unilateral facial weakness overnight. No fever, no skin changes. Diagnosed with Bell's palsy. Antibiotic therapy needed?

Exercise 2: Secondary Cellulitis

Patient with Bell's palsy develops facial erythema and swelling around affected area. Low-grade fever. Outpatient antibiotic choice?

Exercise 3: MRSA Risk

Healthcare worker with Bell's palsy develops facial cellulitis. Recent MRSA exposure. Oral antibiotic with MRSA coverage?

Exercise 4: Hospitalized Cellulitis

Elderly diabetic with Bell's palsy develops severe facial cellulitis requiring hospitalization. IV empiric therapy?

Exercise 5: Malignant Otitis Externa

Diabetic patient with Bell's palsy develops severe otalgia and ear drainage. CT shows skull base osteomyelitis. Treatment?

Exercise 6: Pediatric Dosing

A 25kg child with Bell's palsy develops mild facial cellulitis. Needs clindamycin. Calculate daily dose.

Exercise 7: Duration Question

Patient with facial cellulitis secondary to Bell's palsy completed 7 days of cephalexin. Symptoms resolved. Continue treatment?

Exercise 8: Penicillin Allergy

Patient allergic to penicillin develops facial cellulitis. Alternative to cephalexin?

Exercise 9: Renal Impairment

Patient with CrCl 25 needs ciprofloxacin for malignant otitis externa. Dosing adjustment?

Exercise 10: Treatment Failure

Facial cellulitis not improving after 5 days of cephalexin. Next step?

Exercise 11: Drug Interaction

Patient on warfarin with Bell's palsy develops cellulitis. You prescribe clindamycin. Monitoring needed?

Exercise 12: Misdiagnosis Concern

Patient presents with "Bell's palsy" but has bilateral facial weakness and other neurologic signs. Antibiotic approach?

Clinical Pearl: Bell's palsy itself never requires antibiotics - only treat secondary bacterial complications like cellulitis. Most patients recover with corticosteroids alone, and antivirals show minimal benefit in typical cases.

Encephalitis

Encephalitis is brain parenchyma inflammation presenting with altered mental status, fever, and neurologic symptoms. Most cases are viral (requiring antivirals, not antibiotics), but bacterial causes demand immediate antibiotic therapy. Empiric treatment must cover both bacterial and viral etiologies until diagnosis clarified.

Common Pathogens

- Viral (most common, no antibiotics needed):
  - Herpes simplex virus (HSV)
  - Varicella-zoster virus
  - Enteroviruses
  - West Nile virus
- Bacterial (require antibiotics):
  - Listeria monocytogenes
  - Streptococcus pneumoniae
  - Staphylococcus aureus
  - Gram-negative bacilli
- Other:
  - Mycobacterium tuberculosis
  - Cryptococcus neoformans

Antibiotic Choices

1. Empiric Therapy (before CSF results)

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q12H PLUS ampicillin 2g IV Q4H

Second-line:

- Meropenem 2g IV Q8H PLUS vancomycin 15-20mg/kg IV Q8-12H

2. Targeted Therapy

Listeria:

- Ampicillin 2g IV Q4H PLUS gentamicin 5mg/kg IV Q24H

Pneumococcus:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q12H

Staphylococcus aureus:

- Vancomycin 15-20mg/kg IV Q8-12H (MRSA) or nafcillin 2g IV Q4H (MSSA)

3. Special Considerations

Add acyclovir 10mg/kg IV Q8H for all suspected encephalitis until HSV excluded

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Ceftriaxone	2g	100mg/kg/day	Q12H
Ampicillin	2g	300mg/kg/day	Q4H
Gentamicin	5mg/kg	7.5mg/kg/day	Q24H
Meropenem	2g	120mg/kg/day	Q8H
Nafcillin	2g	200mg/kg/day	Q4H

2. Oral Antibiotics (step-down rarely used)

Drug	Adult Dose	Pediatric Dose	Frequency
Linezolid	600mg	30mg/kg/day	Q12H
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Trimethoprim-sulfamethoxazole	DS 2 tablets	20mg/kg/day (TMP)	Q12H
Doxycycline	100mg	4mg/kg/day	Q12H

3. Renal Adjustments

- Vancomycin: Dose based on levels and CrCl
- Gentamicin: Monitor levels, adjust based on CrCl
- Ceftriaxone: No adjustment unless CrCl <10
- Meropenem: Reduce dose if CrCl <50

Organism Coverage

- Vancomycin: MRSA, MSSA, Streptococci, Enterococci
- Ceftriaxone: MSSA, Streptococci, most gram-negatives, pneumococci
- Ampicillin: Listeria, Streptococci, Enterococci
- Gentamicin: Gram-negatives, synergy with cell wall agents
- Meropenem: Broad spectrum including Listeria and Pseudomonas
- Nafcillin: MSSA, Streptococci (no MRSA)

Contraindications

- Vancomycin: Red man syndrome history (relative)
- Gentamicin: Myasthenia gravis, severe renal disease
- Ampicillin: Severe penicillin allergy
- Meropenem: Severe carbapenem allergy

- Ceftriaxone: Severe penicillin allergy

Adverse Effects

- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Gentamicin: Nephrotoxicity, ototoxicity
- Ampicillin: Allergic reactions, GI upset
- Meropenem: Seizures (high doses), allergic reactions
- Ceftriaxone: Allergic reactions, C. diff colitis

Drug Interactions

- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Gentamicin: Vancomycin (↑ nephrotoxicity), loop diuretics
- Meropenem: Valproic acid (↓ levels), probenecid
- Ceftriaxone: Minimal significant interactions
- Ampicillin: Minimal significant interactions

Treatment Duration

- Bacterial encephalitis: 14-21 days IV
- Listeria: 21 days minimum
- Pneumococcal: 14-21 days
- Staphylococcal: 21-28 days
- Viral encephalitis: No antibiotics (acyclovir 14-21 days)
- Brain abscess: 4-8 weeks total
- Rarely oral step-down except for specific organisms

PRACTICAL EXERCISES

Exercise 1: Empiric Selection

A 45-year-old presents with fever, confusion, and focal neurologic deficits. CSF pending. What empiric antibiotic regimen covers all bacterial causes?

Exercise 2: Listeria Coverage

Why is ampicillin specifically included in empiric encephalitis treatment?

Exercise 3: Targeted Listeria

CSF culture grows Listeria monocytogenes. Targeted therapy regimen?

Exercise 4: Pediatric Dosing

A 30kg child with bacterial encephalitis needs vancomycin. Calculate the dose.

Exercise 5: HSV Consideration

Patient with encephalitis started on antibiotics. CSF shows lymphocytic pleocytosis. Additional therapy needed?

Exercise 6: Duration Decision

Patient with pneumococcal encephalitis completed 14 days IV therapy. Symptoms resolved. Continue treatment?

Exercise 7: Penicillin Allergy

Patient with severe penicillin allergy develops suspected bacterial encephalitis. Alternative to ampicillin?

Exercise 8: Renal Impairment

Patient with CrCl 20 needs gentamicin for Listeria encephalitis. Monitoring required?

Exercise 9: Treatment Response

Patient with bacterial encephalitis not improving after 7 days of appropriate therapy. Next steps?

Exercise 10: MRSA Encephalitis

CSF grows MRSA. Current therapy includes vancomycin. Duration needed?

Exercise 11: Drug Levels

Patient receiving vancomycin + gentamicin develops rising creatinine. Management?

Exercise 12: Viral vs Bacterial

CSF shows 500 WBC (80% lymphocytes), glucose 45, protein 80. Bacterial antibiotics needed?

Clinical Pearl: Always include ampicillin in empiric encephalitis treatment for Listeria coverage, especially in elderly, immunocompromised, or pregnant patients. Add acyclovir until HSV excluded by PCR.

Meningitis

Bacterial meningitis is a medical emergency requiring immediate antibiotic therapy to prevent death and neurologic complications. Classic triad includes fever, neck stiffness, and altered mental status, though all three are present in <50% of cases. Empiric treatment must be started immediately based on age and risk factors, even before lumbar puncture if delayed.

Common Pathogens

- Streptococcus pneumoniae (most common adult)
- Neisseria meningitidis (young adults, clusters)

- Listeria monocytogenes (>50 years, immunocompromised, pregnant)
- Streptococcus agalactiae (Group B Strep, neonates)
- Haemophilus influenzae (unvaccinated children)
- Staphylococcus aureus (post-neurosurgical, trauma)
- Gram-negative bacilli (elderly, immunocompromised)

Antibiotic Choices

1. Empiric Therapy - Adults (18-50 years)

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q12H

2. Empiric Therapy - Adults (>50 years)

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q12H PLUS ampicillin 2g IV Q4H

3. Empiric Therapy - Immunocompromised

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS meropenem 2g IV Q8H

4. Targeted Therapy

Pneumococcus:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q12H

Meningococcus:

- Ceftriaxone 2g IV Q12H (penicillin G if sensitive)

Listeria:

- Ampicillin 2g IV Q4H PLUS gentamicin 5mg/kg IV Q24H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Ceftriaxone	2g	100mg/kg/day	Q12H
Ampicillin	2g	300mg/kg/day	Q4H
Meropenem	2g	120mg/kg/day	Q8H
Penicillin G	4 million units	300,000 units/kg/day	Q4H
Gentamicin	5mg/kg	7.5mg/kg/day	Q24H

2. Oral Antibiotics (prophylaxis only)

Drug	Adult Dose	Pediatric Dose	Frequency
Ciprofloxacin	500mg	20mg/kg	Single dose
Rifampin	600mg	20mg/kg/day	Q12H × 2 days
Azithromycin	500mg	10mg/kg	Single dose
Ceftriaxone	250mg IM	125mg IM	Single dose

3. Renal Adjustments

- Vancomycin: Dose based on levels and CrCl
- Gentamicin: Monitor levels, adjust based on CrCl
- Ceftriaxone: No adjustment unless CrCl <10
- Meropenem: Reduce dose if CrCl <50

Organism Coverage

- Vancomycin: MRSA, MSSA, resistant pneumococci, Enterococci
- Ceftriaxone: MSSA, pneumococci, meningococci, H. influenzae
- Ampicillin: Listeria, Streptococci, Enterococci
- Meropenem: Broad spectrum including Listeria and Pseudomonas
- Penicillin G: Sensitive pneumococci, meningococci, Streptococci
- Gentamicin: Gram-negatives, synergy with cell wall agents

Contraindications

- Vancomycin: Red man syndrome history (relative)
- Gentamicin: Myasthenia gravis, severe renal disease
- Ampicillin: Severe penicillin allergy
- Meropenem: Severe carbapenem allergy
- Penicillin G: Severe penicillin allergy

Adverse Effects

- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Ceftriaxone: Allergic reactions, C. diff colitis

- Ampicillin: Allergic reactions, GI upset
- Meropenem: Seizures (high doses), allergic reactions
- Gentamicin: Nephrotoxicity, ototoxicity

Drug Interactions

- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Gentamicin: Vancomycin (↑ nephrotoxicity), loop diuretics
- Meropenem: Valproic acid (↓ levels)
- Ceftriaxone: Minimal significant interactions
- Ampicillin: Minimal significant interactions

Treatment Duration

- Pneumococcal: 10-14 days
- Meningococcal: 7 days
- Listeria: 21 days minimum
- Group B Strep: 14-21 days
- H. influenzae: 7-10 days
- Gram-negative: 21 days
- Always IV therapy - no oral step-down

PRACTICAL EXERCISES

Exercise 1: Young Adult Empiric

A 25-year-old college student presents with fever, headache, and neck stiffness. Empiric antibiotic regimen?

Exercise 2: Elderly Patient

A 70-year-old nursing home resident with altered mental status and fever. Empiric therapy selection?

Exercise 3: Pneumococcal Treatment

CSF culture grows Streptococcus pneumoniae resistant to penicillin. Targeted therapy?

Exercise 4: Meningococcal Targeted

Blood and CSF cultures grow Neisseria meningitidis sensitive to penicillin. Switch therapy?

Exercise 5: Listeria Duration

Elderly patient with Listeria meningitis improving on ampicillin + gentamicin. Minimum treatment duration?

Exercise 6: Pediatric Dosing

A 40kg child with bacterial meningitis needs ceftriaxone. Calculate daily dose.

Exercise 7: Prophylaxis Decision

College roommate of meningococcal case asks about prevention. Prophylaxis regimen?

Exercise 8: Penicillin Allergy

Patient with severe penicillin allergy develops pneumococcal meningitis. Alternative therapy?

Exercise 9: Renal Impairment

Patient with CrCl 15 needs vancomycin for meningitis. Dosing approach?

Exercise 10: Treatment Failure

Patient not improving after 72 hours of appropriate therapy. Persistent fever and confusion. Next steps?

Exercise 11: Dexamethasone Use

Adult with pneumococcal meningitis. Should dexamethasone be added to antibiotic therapy?

Exercise 12: Duration Question

Patient with meningococcal meningitis completed 7 days IV therapy. Symptoms resolved. Continue treatment?

Clinical Pearl: Never delay antibiotics for lumbar puncture in suspected bacterial meningitis. Give empiric antibiotics immediately, then obtain CSF within 2 hours if possible - cultures remain positive for 24-48 hours after antibiotic initiation.

Spinal or Intracranial Epidural Abscess

Epidural abscess is a neurosurgical emergency requiring immediate antibiotics and often surgical drainage to prevent permanent neurologic damage. Spinal epidural abscess presents with back pain, fever, and progressive neurologic deficits, while intracranial epidural abscess typically follows sinusitis or otitis. Early recognition and aggressive treatment are critical for optimal outcomes.

Common Pathogens

- Staphylococcus aureus (most common, including MRSA)
- Streptococcus species (viridans group, S. milleri)
- Gram-negative bacilli (E. coli, Pseudomonas, Klebsiella)
- Enterococcus species
- Coagulase-negative staphylococci
- Anaerobes (Bacteroides, Prevotella, Fusobacterium)
- Polymicrobial infections (especially post-operative)

Antibiotic Choices

1. Empiric Therapy - Spinal

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q12H PLUS metronidazole 500mg IV Q8H

Second-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS piperacillin-tazobactam 4.5g IV Q6H

2. Empiric Therapy - Intracranial

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q12H PLUS metronidazole 500mg IV Q8H

3. Targeted Therapy

MSSA:

- Nafcillin 2g IV Q4H

MRSA:

- Vancomycin 15-20mg/kg IV Q8-12H or daptomycin 8-10mg/kg IV Q24H

Streptococcus:

- Penicillin G 4 million units IV Q4H or ceftriaxone 2g IV Q12H

Gram-negative:

- Based on susceptibilities (ceftriaxone, ciprofloxacin, or carbapenems)

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Ceftriaxone	2g	100mg/kg/day	Q12H
Metronidazole	500mg	30mg/kg/day	Q8H
Nafcillin	2g	200mg/kg/day	Q4H
Daptomycin	8-10mg/kg	8-10mg/kg	Q24H
Piperacillin-tazobactam	4.5g	300mg/kg/day	Q6H

2. Oral Antibiotics (step-down therapy)

Drug	Adult Dose	Pediatric Dose	Frequency
Linezolid	600mg	30mg/kg/day	Q12H
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Clindamycin	300-450mg	30mg/kg/day	QID
Metronidazole	500mg	30mg/kg/day	Q8H

3. Renal Adjustments

- Vancomycin: Dose based on levels and CrCl
- Daptomycin: Dose Q48H if CrCl <30
- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Metronidazole: Reduce dose if severe hepatic impairment

Organism Coverage

- Vancomycin: MRSA, MSSA, Streptococci, Enterococci
- Ceftriaxone: MSSA, Streptococci, most gram-negatives
- Metronidazole: Anaerobes (Bacteroides, Clostridium)
- Nafcillin: MSSA, Streptococci (no MRSA)
- Daptomycin: MRSA, MSSA, Streptococci, Enterococci
- Piperacillin-tazobactam: Broad spectrum including Pseudomonas

Contraindications

- Vancomycin: Red man syndrome history (relative)
- Daptomycin: Pulmonary eosinophilia history
- Metronidazole: Alcohol use (disulfiram reaction)
- Nafcillin: Severe penicillin allergy
- Ciprofloxacin: Tendon rupture history, myasthenia gravis

Adverse Effects

- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Daptomycin: Myopathy, pulmonary eosinophilia
- Metronidazole: Peripheral neuropathy, disulfiram reaction
- Ceftriaxone: Allergic reactions, C. diff colitis
- Ciprofloxacin: Tendon rupture, QT prolongation

Drug Interactions

- Vancomycin: Aminoglycosides (↑ nephrotoxicity)

- Daptomycin: HMG-CoA reductase inhibitors (↑ myopathy)
- Metronidazole: Warfarin (↑ INR), alcohol (disulfiram reaction)
- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Ceftriaxone: Minimal significant interactions

Treatment Duration

- Total therapy: 4-8 weeks
- IV therapy: 2-6 weeks (until clinical improvement)
- Oral step-down: 2-4 weeks to complete course
- Post-surgical drainage: May shorten total duration
- Intracranial: Often requires longer treatment (6-8 weeks)
- Spinal with neurologic deficits: 6-8 weeks minimum

PRACTICAL EXERCISES

Exercise 1: Spinal Empiric Selection

A 55-year-old diabetic presents with severe back pain, fever, and leg weakness. MRI shows spinal epidural abscess. Empiric antibiotic regimen?

Exercise 2: Intracranial Empiric

Patient with chronic sinusitis develops headache, fever, and focal neurologic signs. CT shows epidural abscess. Initial therapy?

Exercise 3: MRSA Targeted

Epidural abscess drainage grows MRSA. Targeted therapy choice for 6-week course?

Exercise 4: Post-operative

Patient develops epidural abscess after spinal surgery. Empiric coverage should include which organisms?

Exercise 5: Daptomycin Dosing

A 80kg patient needs daptomycin for MRSA epidural abscess. Calculate appropriate dose.

Exercise 6: Duration Decision

Patient with spinal epidural abscess completed 6 weeks therapy. Neurologic function restored, ESR normalized. Continue treatment?

Exercise 7: Step-down Therapy

Patient improving on IV vancomycin after 4 weeks. MRSA susceptible to linezolid. Oral transition appropriate?

Exercise 8: Anaerobic Coverage

Why is metronidazole included in empiric epidural abscess treatment?

Exercise 9: Renal Impairment

Patient with CrCl 25 needs daptomycin for epidural abscess. Dosing adjustment?

Exercise 10: Treatment Failure

Patient not improving after 2 weeks of appropriate antibiotics and drainage. Next steps?

Exercise 11: Drug Interaction

Patient on warfarin needs metronidazole for anaerobic coverage. What monitoring required?

Exercise 12: Pediatric Dosing

A 25kg child with epidural abscess needs vancomycin. Calculate the dose.

Clinical Pearl: Epidural abscess is a neurosurgical emergency - start antibiotics immediately and obtain urgent neurosurgical consultation. Any neurologic deficit warrants emergency surgical drainage to prevent permanent paralysis.

CHAPTER 6: EAR/NOSE/THROAT INFECTIONS

Acute Necrotizing Ulcerative Gingivitis (ANUG)

ANUG is a painful, rapidly progressive periodontal infection characterized by ulcerative necrosis of interdental papillae with a characteristic "punched-out" appearance. It presents with severe gingival pain, bleeding, halitosis, and may be associated with systemic symptoms in severe cases. Treatment involves antibiotics for anaerobic coverage plus local debridement and improved oral hygiene.

Common Pathogens

- Prevotella intermedia
- Fusobacterium nucleatum
- Treponema species (oral spirochetes)
- Bacteroides species
- Porphyromonas gingivalis
- Peptostreptococcus species
- Mixed anaerobic flora

Antibiotic Choices

1. First-line Therapy

Metronidazole:

- 500mg PO TID for 7-10 days

Amoxicillin-clavulanate:

- 875/125mg PO BID for 7-10 days

2. Second-line Therapy

Clindamycin:

- 300mg PO QID for 7-10 days

Doxycycline:

- 100mg PO BID for 7-10 days

3. Severe/Hospitalized Cases

Metronidazole IV:

- 500mg IV Q8H

Clindamycin IV:

- 600-900mg IV Q8H

Standard Dosing

1. IV Antibiotics (severe cases)

Drug	Adult Dose	Pediatric Dose	Frequency
Metronidazole	500mg	30mg/kg/day	Q8H
Clindamycin	600-900mg	40mg/kg/day	Q8H

Ampicillin-sulbactam	3g	200mg/kg/day	Q6H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Metronidazole	500mg	30mg/kg/day	TID
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Clindamycin	300mg	30mg/kg/day	QID
Doxycycline	100mg	4mg/kg/day	BID

3. Renal Adjustments

- Metronidazole: Reduce dose if severe hepatic impairment
- Amoxicillin-clavulanate: Reduce dose if CrCl <30
- Clindamycin: No adjustment needed
- Doxycycline: No adjustment needed

Organism Coverage

- Metronidazole: Excellent anaerobic coverage (Bacteroides, Fusobacterium)
- Amoxicillin-clavulanate: Anaerobes, streptococci, some gram-negatives
- Clindamycin: Anaerobes, gram-positives, some gram-negatives
- Doxycycline: Broad spectrum including spirochetes

Contraindications

- Metronidazole: Alcohol use (disulfiram reaction), pregnancy (first trimester)
- Doxycycline: Pregnancy, children <8 years
- Clindamycin: Previous C. diff infection (relative)
- Amoxicillin-clavulanate: Severe penicillin allergy

Adverse Effects

- Metronidazole: Metallic taste, nausea, disulfiram reaction
- Doxycycline: Photosensitivity, esophagitis, tooth staining
- Clindamycin: C. diff colitis, GI upset
- Amoxicillin-clavulanate: GI upset, allergic reactions

Drug Interactions

- Metronidazole: Warfarin (↑ INR), alcohol (disulfiram reaction)
- Doxycycline: Antacids (↓ absorption), warfarin (↑ INR)
- Clindamycin: Warfarin (↑ INR)
- Amoxicillin-clavulanate: Warfarin (mild ↑ INR)

Treatment Duration

- Mild to moderate: 7-10 days oral therapy
- Severe cases: 7-14 days
- IV therapy: 3-5 days until improvement, then oral
- Adjunctive: Chlorhexidine rinse throughout treatment
- Follow-up: Dental evaluation within 1-2 weeks

PRACTICAL EXERCISES

Exercise 1: Typical Presentation

A 22-year-old college student presents with severe gingival pain, bleeding, and foul breath. Exam shows ulcerated interdental papillae. First-line oral antibiotic?

Exercise 2: Penicillin Allergy

Patient with ANUG has documented penicillin allergy. Cannot use amoxicillin-clavulanate. Alternative first-line therapy?

Exercise 3: Pregnancy Consideration

Pregnant patient in second trimester develops ANUG. Safest antibiotic choice?

Exercise 4: Severe Case

Patient with ANUG, fever, lymphadenopathy, and difficulty swallowing. Requires hospitalization. IV therapy?

Exercise 5: Pediatric Dosing

A 30kg child with ANUG needs metronidazole. Calculate daily dose.

Exercise 6: Duration Decision

Patient with ANUG completed 7 days of metronidazole. Symptoms significantly improved but not completely resolved. Continue treatment?

Exercise 7: Alcohol History

Patient with ANUG admits to daily alcohol use. Which antibiotic should be avoided?

Exercise 8: Treatment Failure

Patient not improving after 5 days of metronidazole. Gingival ulceration persists. Next step?

Exercise 9: Drug Interaction

Patient on warfarin develops ANUG. You prescribe metronidazole. What monitoring needed?

Exercise 10: Alternative Coverage

Patient cannot tolerate metronidazole due to severe nausea. Alternative with good anaerobic coverage?

Exercise 11: Adolescent Treatment

A 16-year-old with ANUG. Can doxycycline be used safely?

Exercise 12: Adjunctive Therapy

Besides antibiotics, what additional treatment should be recommended for ANUG?

Clinical Pearl: ANUG responds rapidly to appropriate antibiotic therapy, but mechanical debridement and improved oral hygiene are essential for complete resolution. Most patients show improvement within 24-48 hours of starting metronidazole.

Dental Abscess

Dental abscess is a localized purulent infection involving tooth root or periodontal tissues, presenting with severe toothache, facial swelling, and sometimes systemic symptoms. Most cases require dental drainage as primary treatment, with antibiotics as adjunctive therapy for spreading infection or systemic involvement. Polymicrobial

infections typically involve both aerobic and anaerobic oral flora.

Common Pathogens

- Streptococcus viridans group (alpha-hemolytic streptococci)
- Peptostreptococcus species (anaerobic gram-positive cocci)
- Prevotella species (anaerobic gram-negative rods)
- Fusobacterium nucleatum (anaerobic gram-negative rods)
- Bacteroides species
- Porphyromonas gingivalis
- Actinomyces species (chronic cases)
- Mixed aerobic-anaerobic flora

Antibiotic Choices

1. First-line Therapy

Amoxicillin-clavulanate:

- 875/125mg PO BID for 7-10 days

Clindamycin:

- 300-450mg PO QID for 7-10 days

2. Second-line Therapy

Azithromycin:

- 500mg PO daily for 3 days

Metronidazole PLUS amoxicillin:

- Metronidazole 500mg PO TID PLUS amoxicillin 500mg PO TID

3. Severe/Hospitalized Cases

Ampicillin-sulbactam:

- 3g IV Q6H

Clindamycin IV:

- 600-900mg IV Q8H

Standard Dosing

1. IV Antibiotics (severe cases)

Drug	Adult Dose	Pediatric Dose	Frequency
Ampicillin-sulbactam	3g	200mg/kg/day	Q6H
Clindamycin	600-900mg	40mg/kg/day	Q8H
Metronidazole	500mg	30mg/kg/day	Q8H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Clindamycin	300-450mg	30mg/kg/day	QID
Azithromycin	500mg	10mg/kg/day	Daily
Metronidazole	500mg	30mg/kg/day	TID
Amoxicillin	500mg	90mg/kg/day	TID

3. Renal Adjustments

- Amoxicillin-clavulanate: Reduce dose if CrCl <30
- Clindamycin: No adjustment needed
- Metronidazole: Reduce dose if severe hepatic impairment
- Azithromycin: No adjustment needed

Organism Coverage

- Amoxicillin-clavulanate: Streptococci, anaerobes, beta-lactamase producers
- Clindamycin: Streptococci, anaerobes, some gram-negatives
- Azithromycin: Streptococci, some anaerobes, atypicals
- Metronidazole: Excellent anaerobic coverage
- Amoxicillin: Streptococci (no anaerobic coverage alone)

Contraindications

- Amoxicillin-clavulanate: Severe penicillin allergy
- Clindamycin: Previous C. diff infection (relative)
- Metronidazole: Alcohol use (disulfiram reaction)
- Azithromycin: QT prolongation, myasthenia gravis

Adverse Effects

- Amoxicillin-clavulanate: GI upset, allergic reactions
- Clindamycin: C. diff colitis, GI upset
- Metronidazole: Metallic taste, nausea, disulfiram reaction
- Azithromycin: QT prolongation, GI upset

Drug Interactions

- Amoxicillin-clavulanate: Warfarin (mild ↑ INR)
- Clindamycin: Warfarin (↑ INR)
- Metronidazole: Warfarin (↑ INR), alcohol (disulfiram reaction)

- Azithromycin: QT-prolonging drugs, warfarin (mild ↑ INR)

Treatment Duration

- Uncomplicated: 7-10 days
- Facial cellulitis: 10-14 days
- Severe/hospitalized: 10-14 days
- IV therapy: 3-5 days until improvement, then oral
- Post-drainage: 5-7 days if adequate drainage

PRACTICAL EXERCISES

Exercise 1: Uncomplicated Abscess

A 35-year-old presents with severe toothache and localized facial swelling. No systemic symptoms. First-line oral antibiotic?

Exercise 2: Penicillin Allergy

Patient with dental abscess has documented penicillin allergy. Cannot use amoxicillin-clavulanate. Best alternative?

Exercise 3: Severe Presentation

Patient with dental abscess, facial cellulitis, fever, and trismus requiring hospitalization. IV empiric therapy?

Exercise 4: Pediatric Dosing

A 20kg child with dental abscess needs clindamycin. Calculate daily dose.

Exercise 5: Quick Course Option

Patient prefers shorter antibiotic course for dental abscess. Which option provides 3-day treatment?

Exercise 6: Combination Therapy

When might you use metronidazole PLUS amoxicillin for dental abscess?

Exercise 7: Duration Decision

Patient with dental abscess completed 7 days of clindamycin. Swelling resolved, no pain. Continue treatment?

Exercise 8: Treatment Failure

Patient not improving after 5 days of amoxicillin-clavulanate. Persistent swelling and pain. Next step?

Exercise 9: Alcohol History

Patient with dental abscess reports daily alcohol consumption. Which antibiotic should be avoided?

Exercise 10: Drug Interaction

Patient on warfarin develops dental abscess. You prescribe clindamycin. Monitoring needed?

Exercise 11: Post-drainage

Patient had dental abscess drained. Adequate drainage achieved. Still needs antibiotics?

Exercise 12: Pregnancy

Pregnant patient in second trimester with dental abscess. Safest antibiotic choice?

Clinical Pearl: Dental abscesses require definitive dental treatment (drainage/extraction) as primary therapy. Antibiotics alone are insufficient - they should be reserved

for spreading infection, systemic symptoms, or as adjunctive therapy to dental procedures.

Epiglottitis

Epiglottitis is a life-threatening infection of the epiglottis and supraglottic structures causing airway obstruction. It presents with fever, sore throat, drooling, muffled voice, and stridor in the classic "tripod" position. Immediate airway management and IV antibiotics are essential as respiratory failure can occur rapidly.

Common Pathogens

- Haemophilus influenzae type b (Hib - rare since vaccination)
- Streptococcus pneumoniae (most common in adults)
- Streptococcus pyogenes (Group A Strep)
- Staphylococcus aureus (including MRSA)
- Haemophilus influenzae non-typeable
- Moraxella catarrhalis
- Neisseria species

Antibiotic Choices

1. Empiric Therapy - Adults

First-line:

- Ceftriaxone 2g IV Q24H

Second-line:

- Cefotaxime 2g IV Q8H
- Ampicillin-sulbactam 3g IV Q6H

2. MRSA Risk Factors Present

Add vancomycin:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q24H

3. Targeted Therapy

H. influenzae:

- Ceftriaxone 2g IV Q24H

S. pneumoniae:

- Ceftriaxone 2g IV Q24H (or vancomycin if resistant)

S. aureus (MSSA):

- Nafcillin 2g IV Q4H or cefazolin 2g IV Q8H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Ceftriaxone	2g	100mg/kg/day	Q24H
Cefotaxime	2g	200mg/kg/day	Q8H
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Ampicillin-sulbactam	3g	200mg/kg/day	Q6H
Nafcillin	2g	200mg/kg/day	Q4H

2. Oral Antibiotics (step-down therapy)

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Azithromycin	500mg	10mg/kg/day	Daily
Cephalexin	500mg	50mg/kg/day	QID
Clindamycin	300-450mg	30mg/kg/day	QID

3. Renal Adjustments

- Ceftriaxone: No adjustment unless CrCl <10
- Vancomycin: Dose based on levels and CrCl
- Cefotaxime: Reduce dose if CrCl <20
- Ampicillin-sulbactam: Reduce dose if CrCl <30

Organism Coverage

- Ceftriaxone: H. influenzae, S. pneumoniae, S. pyogenes, M. catarrhalis
- Vancomycin: MRSA, MSSA, resistant S. pneumoniae
- Ampicillin-sulbactam: H. influenzae, S. pneumoniae, S. aureus
- Nafcillin: MSSA, S. pneumoniae, S. pyogenes
- Azithromycin: H. influenzae, S. pneumoniae, atypicals

Contraindications

- Ceftriaxone: Severe penicillin allergy (relative)
- Vancomycin: Red man syndrome history (relative)
- Ampicillin-sulbactam: Severe penicillin allergy
- Nafcillin: Severe penicillin allergy

Adverse Effects

- Ceftriaxone: Allergic reactions, C. diff colitis
- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Ampicillin-sulbactam: Allergic reactions, GI upset
- Nafcillin: Allergic reactions, interstitial nephritis

Drug Interactions

- Ceftriaxone: Minimal significant interactions
- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Ampicillin-sulbactam: Warfarin (mild ↑ INR)
- Nafcillin: Warfarin (↓ INR)

Treatment Duration

- Total therapy: 7-10 days
- IV therapy: 3-5 days until clinical improvement
- Oral step-down: When able to swallow and afebrile 24-48 hours
- Severe cases: May require 10-14 days total
- Airway secure: Before considering oral transition

PRACTICAL EXERCISES

Exercise 1: Adult Empiric Selection

A 45-year-old presents with fever, sore throat, drooling, and stridor. CT shows epiglottic swelling. Empiric antibiotic?

Exercise 2: Pediatric Case

A 8-year-old with epiglottitis, intubated for airway protection. Weight 25kg. Calculate ceftriaxone dose.

Exercise 3: MRSA Risk

Healthcare worker with epiglottitis and recent MRSA exposure. Modify empiric regimen?

Exercise 4: H. influenzae Targeted

Blood cultures grow H. influenzae type b. Current therapy is ceftriaxone. Continue or modify?

Exercise 5: Step-down Decision

Patient with epiglottitis improving on IV ceftriaxone after 4 days. Afebrile, able to swallow. Oral option?

Exercise 6: Duration Question

Patient with epiglottitis completed 7 days therapy (4 days IV + 3 days oral). Symptoms resolved. Continue?

Exercise 7: Penicillin Allergy

Patient with severe penicillin allergy develops epiglottitis. Alternative to ceftriaxone?

Exercise 8: Resistant Pneumococcus

S. pneumoniae isolated, resistant to penicillin and ceftriaxone. Targeted therapy?

Exercise 9: Renal Impairment

Patient with CrCl 15 needs vancomycin for epiglottitis. Dosing approach?

Exercise 10: Treatment Response

Patient not improving after 48 hours of appropriate antibiotics. Persistent fever, airway compromise. Next steps?

Exercise 11: Prophylaxis Question

Household contacts of H. influenzae epiglottitis case ask about prevention. Recommendations?

Exercise 12: Airway Management

Patient with epiglottitis has secured airway via intubation. When safe to consider oral antibiotics?

Clinical Pearl: Never attempt direct laryngoscopy in suspected epiglottitis - can precipitate complete airway obstruction. Secure airway first in operating room, then start antibiotics. Most adult cases are now S. pneumoniae rather than H. influenzae.

Ludwig's Angina

Ludwig's angina is a rapidly progressive, life-threatening cellulitis of the floor of the mouth involving bilateral submandibular spaces. It presents with fever, drooling, muffled voice, trismus, and a characteristic "bull neck" appearance with woody induration. Immediate airway management and IV antibiotics are essential as airway obstruction can develop rapidly.

Common Pathogens

- Streptococcus viridans group (alpha-hemolytic streptococci)
- Streptococcus pyogenes (Group A Strep)
- Staphylococcus aureus (including MRSA)
- Peptostreptococcus species (anaerobic streptococci)
- Prevotella species (anaerobic gram-negative rods)
- Fusobacterium nucleatum (anaerobic gram-negative rods)
- Bacteroides species
- Polymicrobial aerobic-anaerobic infections

Antibiotic Choices

1. Empiric Therapy

First-line:

- Ampicillin-sulbactam 3g IV Q6H

Second-line:

- Clindamycin 600-900mg IV Q8H PLUS ceftriaxone 2g IV Q24H

2. MRSA Risk Factors

Add vancomycin:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ampicillin-sulbactam 3g IV Q6H

3. Severe/ICU Cases

Broad spectrum:

- Piperacillin-tazobactam 4.5g IV Q6H PLUS vancomycin 15-20mg/kg IV Q8-12H

4. Targeted Therapy

Streptococcus:

- Penicillin G 4 million units IV Q4H PLUS clindamycin 600mg IV Q8H

MRSA:

- Vancomycin 15-20mg/kg IV Q8-12H or linezolid 600mg IV Q12H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Ampicillin-sulbactam	3g	200mg/kg/day	Q6H
Clindamycin	600-900mg	40mg/kg/day	Q8H
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Ceftriaxone	2g	100mg/kg/day	Q24H
Piperacillin-tazobactam	4.5g	300mg/kg/day	Q6H
Penicillin G	4 million units	300,000 units/kg/day	Q4H

2. Oral Antibiotics (step-down therapy)

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Clindamycin	300-450mg	30mg/kg/day	QID
Linezolid	600mg	30mg/kg/day	Q12H
Metronidazole	500mg	30mg/kg/day	TID

3. Renal Adjustments

- Ampicillin-sulbactam: Reduce dose if CrCl <30
- Vancomycin: Dose based on levels and CrCl

- Piperacillin-tazobactam: Reduce dose if CrCl <40
- Clindamycin: No adjustment needed

Organism Coverage

- Ampicillin-sulbactam: Streptococci, anaerobes, MSSA, beta-lactamase producers
- Clindamycin: Streptococci, anaerobes, some MRSA
- Vancomycin: MRSA, MSSA, Streptococci, Enterococci
- Piperacillin-tazobactam: Broad spectrum including Pseudomonas
- Penicillin G: Streptococci, anaerobic gram-positives

Contraindications

- Ampicillin-sulbactam: Severe penicillin allergy
- Clindamycin: Previous C. diff infection (relative)
- Vancomycin: Red man syndrome history (relative)
- Penicillin G: Severe penicillin allergy

Adverse Effects

- Ampicillin-sulbactam: Allergic reactions, GI upset
- Clindamycin: C. diff colitis, GI upset
- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Piperacillin-tazobactam: Allergic reactions, C. diff colitis

Drug Interactions

- Ampicillin-sulbactam: Warfarin (mild ↑ INR)
- Clindamycin: Warfarin (↑ INR)
- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Piperacillin-tazobactam: Warfarin (↑ INR)

Treatment Duration

- Total therapy: 10-14 days
- IV therapy: 5-10 days until clinical improvement
- Oral step-down: When able to swallow and afebrile 48 hours
- Severe cases: May require 14-21 days
- Post-surgical drainage: 7-10 days

PRACTICAL EXERCISES

Exercise 1: Classic Presentation

A 40-year-old with poor dentition presents with fever, drooling, "bull neck" swelling, and difficulty speaking. Empiric antibiotic?

Exercise 2: MRSA Risk

Patient with Ludwig's angina has recent hospitalization and MRSA history. Modify empiric therapy?

Exercise 3: Penicillin Allergy

Patient allergic to penicillin develops Ludwig's angina. Alternative to ampicillin-sulbactam?

Exercise 4: Pediatric Dosing

A 30kg child with Ludwig's angina needs clindamycin. Calculate IV dose.

Exercise 5: Severe ICU Case

Intubated patient with Ludwig's angina and septic shock. Broad-spectrum regimen?

Exercise 6: Step-down Decision

Patient improving on IV ampicillin-sulbactam after 7 days. Afebrile, swallowing well. Oral option?

Exercise 7: Duration Question

Patient completed 10 days therapy for Ludwig's angina. Symptoms resolved. Continue treatment?

Exercise 8: Treatment Failure

No improvement after 72 hours of appropriate antibiotics. Persistent fever and swelling. Next steps?

Exercise 9: Anaerobic Coverage

Why is anaerobic coverage essential in Ludwig's angina treatment?

Exercise 10: Surgical Indication

When should surgical drainage be considered in Ludwig's angina?

Exercise 11: Renal Impairment

Patient with CrCl 20 needs vancomycin for MRSA Ludwig's angina. Dosing approach?

Exercise 12: Airway Management

Patient with Ludwig's angina develops stridor. Priority intervention?

Clinical Pearl: Ludwig's angina is an airway emergency - secure the airway first, then start antibiotics. The infection spreads along fascial planes rather than forming abscesses, so early aggressive medical therapy can often avoid surgical intervention.

Mastoiditis

Mastoiditis is infection of the mastoid air cells, typically following acute otitis media, presenting with postauricular pain, swelling, and erythema. It can progress to serious complications including meningitis, brain abscess, or lateral sinus thrombosis. Prompt IV antibiotic therapy is essential to prevent intracranial extension.

Common Pathogens

- Streptococcus pneumoniae (most common)
- Streptococcus pyogenes (Group A Strep)
- Staphylococcus aureus (including MRSA)
- Haemophilus influenzae (unvaccinated children)
- Pseudomonas aeruginosa (chronic cases, swimmers)
- Proteus mirabilis
- Enterobacteriaceae (chronic drainage)
- Anaerobes (chronic cases with cholesteatoma)

Antibiotic Choices

1. Empiric Therapy - Acute

First-line:

- Ceftriaxone 2g IV Q24H

Second-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q24H

2. Chronic/Complicated

First-line:

- Piperacillin-tazobactam 4.5g IV Q6H

With MRSA risk:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS piperacillin-tazobactam 4.5g IV Q6H

3. Targeted Therapy

S. pneumoniae:

- Ceftriaxone 2g IV Q24H (or vancomycin if resistant)

MRSA:

- Vancomycin 15-20mg/kg IV Q8-12H

Pseudomonas:

- Cefepime 2g IV Q8H or piperacillin-tazobactam 4.5g IV Q6H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Ceftriaxone	2g	100mg/kg/day	Q24H
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Piperacillin-tazobactam	4.5g	300mg/kg/day	Q6H
Cefepime	2g	150mg/kg/day	Q8H
Ciprofloxacin	400mg	30mg/kg/day	Q12H

2. Oral Antibiotics (step-down therapy)

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Clindamycin	300-450mg	30mg/kg/day	QID
Linezolid	600mg	30mg/kg/day	Q12H

3. Renal Adjustments

- Ceftriaxone: No adjustment unless CrCl <10
- Vancomycin: Dose based on levels and CrCl
- Piperacillin-tazobactam: Reduce dose if CrCl <40
- Ciprofloxacin: Reduce dose 50% if CrCl <30

Organism Coverage

- Ceftriaxone: S. pneumoniae, S. pyogenes, H. influenzae
- Vancomycin: MRSA, MSSA, resistant S. pneumoniae
- Piperacillin-tazobactam: Broad spectrum including Pseudomonas
- Cefepime: Gram-negatives including Pseudomonas, some gram-positives
- Ciprofloxacin: Excellent Pseudomonas coverage, some gram-positives

Contraindications

- Ceftriaxone: Severe penicillin allergy (relative)
- Vancomycin: Red man syndrome history (relative)
- Ciprofloxacin: Tendon rupture history, myasthenia gravis
- Piperacillin-tazobactam: Severe penicillin allergy

Adverse Effects

- Ceftriaxone: Allergic reactions, C. diff colitis
- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Ciprofloxacin: Tendon rupture, QT prolongation
- Piperacillin-tazobactam: Allergic reactions, C. diff colitis

Drug Interactions

- Ceftriaxone: Minimal significant interactions
- Vancomycin: Aminoglycosides (↑ nephrotoxicity)

- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Piperacillin-tazobactam: Warfarin (↑ INR)

Treatment Duration

- Acute mastoiditis: 10-14 days total
- Chronic mastoiditis: 14-21 days
- IV therapy: 5-10 days until clinical improvement
- Oral step-down: When afebrile 48 hours and improving
- Complicated cases: 21-28 days
- Post-surgical: 7-14 days depending on procedure

PRACTICAL EXERCISES

Exercise 1: Acute Presentation

A 8-year-old with recent otitis media develops postauricular swelling and tenderness. CT shows mastoid opacification. Empiric antibiotic?

Exercise 2: Adult Case

A 45-year-old swimmer with chronic ear drainage develops mastoiditis. Which pathogen should you especially consider?

Exercise 3: MRSA Risk

Child with mastoiditis and recent hospitalization for pneumonia. Modify empiric therapy?

Exercise 4: Pediatric Dosing

A 25kg child needs ceftriaxone for mastoiditis. Calculate daily dose.

Exercise 5: Chronic Case

Patient with chronic mastoiditis and cholesteatoma. Empiric regimen should cover which organisms?

Exercise 6: Pseudomonas Coverage

Culture grows Pseudomonas aeruginosa from mastoid drainage. Targeted therapy options?

Exercise 7: Step-down Decision

Patient improving on IV ceftriaxone after 7 days. Afebrile, decreased swelling. Oral option?

Exercise 8: Duration Question

Patient with acute mastoiditis completed 10 days therapy. Symptoms resolved. Continue treatment?

Exercise 9: Surgical Indication

When should surgical intervention be considered in mastoiditis?

Exercise 10: Complications

Patient with mastoiditis develops headache, neck stiffness, and altered mental status. Concern and management?

Exercise 11: Renal Impairment

Patient with CrCl 20 needs vancomycin for MRSA mastoiditis. Dosing approach?

Exercise 12: Treatment Failure

No improvement after 5 days of appropriate antibiotics. Persistent fever and swelling. Next steps?

Clinical Pearl: Mastoiditis can rapidly progress to intracranial complications. Any neurologic symptoms (headache, altered mental status, focal deficits) warrant urgent imaging and neurosurgical consultation alongside aggressive antibiotic therapy.

Otitis Externa

Otitis externa is inflammation of the external ear canal, commonly known as "swimmer's ear," presenting with ear pain, itching, and discharge. Most cases are mild and respond to topical therapy, but severe cases may require systemic antibiotics. Malignant otitis externa is a serious necrotizing infection requiring aggressive treatment.

Common Pathogens

- Pseudomonas aeruginosa (most common)
- Staphylococcus aureus (including MRSA)
- Proteus mirabilis
- Enterobacter species
- Streptococcus species
- Candida species (fungal)
- Aspergillus species (fungal)

Antibiotic Choices

1. Mild Cases (Topical Only)

First-line:

- Ciprofloxacin 0.3% otic drops 3-4 drops BID
- Ofloxacin 0.3% otic drops 3-4 drops BID

Second-line:

- Polymyxin B/neomycin/hydrocortisone drops 3-4 drops TID

2. Severe/Systemic Cases

Oral therapy:

- Ciprofloxacin 500-750mg PO BID

IV therapy (malignant OE):

- Ciprofloxacin 400mg IV Q12H
- Piperacillin-tazobactam 4.5g IV Q6H

3. MRSA Suspected

Add:

- Vancomycin 15-20mg/kg IV Q8-12H

Standard Dosing

1. IV Antibiotics (malignant otitis externa)

Drug	Adult Dose	Pediatric Dose	Frequency
Ciprofloxacin	400mg	30mg/kg/day	Q12H
Piperacillin-tazobactam	4.5g	300mg/kg/day	Q6H
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Cefepime	2g	150mg/kg/day	Q8H

2. Oral Antibiotics (severe cases)

Drug	Adult Dose	Pediatric Dose	Frequency
Ciprofloxacin	500-750mg	30mg/kg/day	Q12H
Clindamycin	300-450mg	30mg/kg/day	QID
Doxycycline	100mg	4mg/kg/day	Q12H

3. Topical Antibiotics

Drug	Adult/Pediatric Dose	Frequency	Duration
Ciprofloxacin 0.3% drops	3-4 drops	BID	7 days
Ofloxacin 0.3% drops	3-4 drops	BID	7 days
Polymyxin B combination	3-4 drops	TID	7-10 days

4. Renal Adjustments

- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Vancomycin: Dose based on levels and CrCl
- Piperacillin-tazobactam: Reduce dose if CrCl <40

Organism Coverage

- Ciprofloxacin: Excellent Pseudomonas coverage, gram-negatives
- Ofloxacin: Similar to ciprofloxacin
- Polymyxin B: Pseudomonas, gram-negatives
- Vancomycin: MRSA, MSSA, gram-positives

- Piperacillin-tazobactam: Broad spectrum including Pseudomonas

Contraindications

- Fluoroquinolone drops: Perforated tympanic membrane (relative)
- Ciprofloxacin oral/IV: Tendon rupture history, myasthenia gravis
- Neomycin drops: Known hypersensitivity (common)
- Vancomycin: Red man syndrome history (relative)

Adverse Effects

- Ciprofloxacin: Tendon rupture (systemic), local irritation (topical)
- Polymyxin B drops: Local irritation, allergic reactions
- Neomycin: Contact dermatitis, ototoxicity
- Vancomycin: Nephrotoxicity, ototoxicity

Drug Interactions

- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Topical agents: Minimal systemic interactions
- Vancomycin: Aminoglycosides (↑ nephrotoxicity)

Treatment Duration

- Mild otitis externa: 7 days topical therapy
- Moderate cases: 7-10 days topical therapy
- Severe with systemic symptoms: 7-14 days oral antibiotics
- Malignant otitis externa: 6-12 weeks IV/oral therapy

- Fungal cases: 14-21 days antifungal therapy

PRACTICAL EXERCISES

Exercise 1: Mild Swimmer's Ear

A 25-year-old swimmer develops ear pain and itching after pool use. Exam shows erythematous ear canal. First-line treatment?

Exercise 2: Diabetic Patient

A 70-year-old diabetic with severe ear pain, purulent discharge, and granulation tissue in ear canal. Suspected diagnosis and treatment?

Exercise 3: Perforated Eardrum

Patient with otitis externa has visible tympanic membrane perforation. Which topical antibiotic is contraindicated?

Exercise 4: Treatment Failure

Patient not improving after 7 days of ciprofloxacin drops. Persistent pain and discharge. Next step?

Exercise 5: Pediatric Case

A 12-year-old needs oral ciprofloxacin for severe otitis externa. Weight 40kg. Calculate dose.

Exercise 6: MRSA Risk

Healthcare worker with severe otitis externa and known MRSA colonization. Treatment approach?

Exercise 7: Duration Question

Patient with mild otitis externa completed 7 days of topical ciprofloxacin. Symptoms resolved. Continue treatment?

Exercise 8: Fungal Suspicion

Patient with chronic otitis externa shows white, fluffy discharge. Likely pathogen and treatment?

Exercise 9: Malignant OE Duration

Diabetic patient with malignant otitis externa improving on IV ciprofloxacin after 4 weeks. Continue treatment how long?

Exercise 10: Allergy History

Patient develops contact dermatitis from topical antibiotic drops. Which ingredient is most likely culprit?

Exercise 11: Systemic Therapy

When should oral antibiotics be considered for otitis externa?

Exercise 12: Prevention Counseling

Swimmer asks about preventing recurrent otitis externa. Key recommendations?

Clinical Pearl: Most otitis externa responds to topical therapy alone. Reserve systemic antibiotics for severe cases, cellulitis, or treatment failure. In diabetics with severe ear pain and granulation tissue, suspect malignant otitis externa requiring aggressive IV therapy.

Otitis Media

Otitis media is middle ear infection commonly affecting children, presenting with ear pain, fever, and hearing loss. Most cases are viral and self-resolve, but bacterial infections require antibiotic therapy. Watchful waiting is appropriate for

many cases, with antibiotics reserved for severe symptoms or high-risk patients.

Common Pathogens

- Streptococcus pneumoniae (most common bacterial)
- Haemophilus influenzae (non-typeable)
- Moraxella catarrhalis
- Streptococcus pyogenes (Group A Strep)
- Staphylococcus aureus (complications)
- Viral pathogens (majority of cases)

Antibiotic Choices

1. First-line Therapy

Amoxicillin:

- 80-90mg/kg/day PO divided BID-TID (pediatric)
- 875mg PO BID (adult)

2. High-dose for Resistant Pneumococcus

Amoxicillin high-dose:

- 90mg/kg/day PO divided BID (pediatric)

3. Beta-lactamase Coverage

Amoxicillin-clavulanate:

- 90mg/kg/day PO divided BID (pediatric)
- 875/125mg PO BID (adult)

4. Penicillin Allergy

Azithromycin:

- 10mg/kg day 1, then 5mg/kg days 2-5 (pediatric)
- 500mg day 1, then 250mg days 2-5 (adult)

Clindamycin:

- 30-40mg/kg/day PO divided TID (pediatric)
- 300mg PO TID (adult)

Standard Dosing

1. IV Antibiotics (severe/hospitalized)

Drug	Adult Dose	Pediatric Dose	Frequency
Ceftriaxone	1-2g	50-75mg/kg/day	Q24H
Ampicillin	2g	200mg/kg/day	Q6H
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin	875mg	80-90mg/kg/day	BID
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Azithromycin	500mg day 1, 250mg days 2-5	10mg/kg day 1, 5mg/kg days 2-5	Daily
Clindamycin	300mg	30-40mg/kg/day	TID
Cephalexin	500mg	75-100mg/kg/day	QID

3. Renal Adjustments

- Amoxicillin: Reduce dose if CrCl <30
- Amoxicillin-clavulanate: Reduce dose if CrCl <30
- Azithromycin: No adjustment needed

- Ceftriaxone: No adjustment unless CrCl <10

Organism Coverage

- Amoxicillin: S. pneumoniae, S. pyogenes (no beta-lactamase producers)
- Amoxicillin-clavulanate: Above plus H. influenzae, M. catarrhalis
- Azithromycin: Atypicals, some pneumococci, H. influenzae
- Clindamycin: S. pneumoniae, S. pyogenes, anaerobes
- Ceftriaxone: Broad gram-positive and gram-negative coverage

Contraindications

- Amoxicillin: Severe penicillin allergy
- Azithromycin: QT prolongation, myasthenia gravis
- Clindamycin: Previous C. diff infection (relative)
- Ceftriaxone: Severe penicillin allergy (relative)

Adverse Effects

- Amoxicillin: GI upset, allergic reactions, rash
- Amoxicillin-clavulanate: Diarrhea, GI upset
- Azithromycin: QT prolongation, GI upset
- Clindamycin: C. diff colitis, GI upset

Drug Interactions

- Amoxicillin: Warfarin (mild ↑ INR)
- Azithromycin: QT-prolonging drugs, warfarin
- Clindamycin: Warfarin (↑ INR)
- Amoxicillin-clavulanate: Warfarin (mild ↑ INR)

Treatment Duration

- Uncomplicated (age >2 years): 5-7 days
- Children <2 years: 10 days
- Severe symptoms: 10 days
- Recurrent infections: 10 days
- Complications (mastoiditis): 10-14 days

PRACTICAL EXERCISES

Exercise 1: Typical Pediatric Case

A 3-year-old with ear pain, fever 101°F, and bulging red tympanic membrane. First-line antibiotic?

Exercise 2: Watchful Waiting

A 4-year-old with mild ear pain, no fever, and slightly red tympanic membrane. Management approach?

Exercise 3: Treatment Failure

Child not improving after 48-72 hours of amoxicillin. Next antibiotic choice?

Exercise 4: Penicillin Allergy

A 6-year-old allergic to penicillin develops acute otitis media. Alternative therapy?

Exercise 5: Pediatric Dosing

A 20kg child needs amoxicillin for otitis media. Calculate daily dose.

Exercise 6: Adult Case

A 35-year-old adult with acute otitis media. Antibiotic choice and duration?

Exercise 7: Duration Decision

A 18-month-old completed 5 days of amoxicillin for otitis media. Continue treatment?

Exercise 8: Recurrent Infections

Child with third episode of otitis media in 4 months. Treatment approach?

Exercise 9: High-risk Patient

A 15-month-old in daycare with bilateral otitis media and fever 103°F. Antibiotic choice?

Exercise 10: Azithromycin Dosing

A 25kg child needs azithromycin for otitis media. Calculate 5-day course.

Exercise 11: Complications

Child with otitis media develops postauricular swelling. Diagnosis and treatment?

Exercise 12: Prevention Question

Parent asks about preventing recurrent otitis media. Key recommendations?

Clinical Pearl: Most otitis media is viral and self-resolves. Use watchful waiting for mild cases in children >2 years. Reserve antibiotics for severe symptoms, high-risk patients (age <2, daycare, bilateral disease), or treatment failure.

Parapharyngeal Abscess

Parapharyngeal abscess is a deep neck infection involving the parapharyngeal space, typically following dental infections, pharyngitis, or penetrating trauma. It presents with fever, sore throat, trismus, muffled voice, and unilateral neck swelling with potential airway compromise. Immediate IV antibiotics and surgical drainage are essential to prevent life-threatening complications.

Common Pathogens

- Streptococcus viridans group (alpha-hemolytic streptococci)
- Streptococcus pyogenes (Group A Strep)
- Staphylococcus aureus (including MRSA)
- Peptostreptococcus species (anaerobic streptococci)
- Prevotella species (anaerobic gram-negative rods)
- Fusobacterium nucleatum (anaerobic gram-negative rods)
- Bacteroides species
- Polymicrobial aerobic-anaerobic infections

Antibiotic Choices

1. Empiric Therapy

First-line:

- Ampicillin-sulbactam 3g IV Q6H

Second-line:

- Clindamycin 600-900mg IV Q8H PLUS ceftriaxone 2g IV Q24H

2. MRSA Risk Factors

Add vancomycin:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ampicillin-sulbactam 3g IV Q6H

3. Severe/ICU Cases

Broad spectrum:

- Piperacillin-tazobactam 4.5g IV Q6H PLUS vancomycin 15-20mg/kg IV Q8-12H

4. Targeted Therapy

Streptococcus:

- Penicillin G 4 million units IV Q4H PLUS clindamycin 600mg IV Q8H

MRSA:

- Vancomycin 15-20mg/kg IV Q8-12H or linezolid 600mg IV Q12H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Ampicillin-sulbactam	3g	200mg/kg/day	Q6H
Clindamycin	600-900mg	40mg/kg/day	Q8H
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H

Ceftriaxone	2g	100mg/kg/day	Q24H
Piperacillin-tazobactam	4.5g	300mg/kg/day	Q6H
Penicillin G	4 million units	300,000 units/kg/day	Q4H

2. Oral Antibiotics (step-down therapy)

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Clindamycin	300-450mg	30mg/kg/day	QID
Linezolid	600mg	30mg/kg/day	Q12H
Metronidazole	500mg	30mg/kg/day	TID

3. Renal Adjustments

- Ampicillin-sulbactam: Reduce dose if CrCl <30
- Vancomycin: Dose based on levels and CrCl
- Piperacillin-tazobactam: Reduce dose if CrCl <40
- Clindamycin: No adjustment needed

Organism Coverage

- Ampicillin-sulbactam: Streptococci, anaerobes, MSSA, beta-lactamase producers
- Clindamycin: Streptococci, anaerobes, some MRSA
- Vancomycin: MRSA, MSSA, Streptococci, Enterococci
- Piperacillin-tazobactam: Broad spectrum including Pseudomonas

- Penicillin G: Streptococci, anaerobic gram-positives

Contraindications

- Ampicillin-sulbactam: Severe penicillin allergy
- Clindamycin: Previous C. diff infection (relative)
- Vancomycin: Red man syndrome history (relative)
- Penicillin G: Severe penicillin allergy

Adverse Effects

- Ampicillin-sulbactam: Allergic reactions, GI upset
- Clindamycin: C. diff colitis, GI upset
- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Piperacillin-tazobactam: Allergic reactions, C. diff colitis

Drug Interactions

- Ampicillin-sulbactam: Warfarin (mild ↑ INR)
- Clindamycin: Warfarin (↑ INR)
- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Piperacillin-tazobactam: Warfarin (↑ INR)

Treatment Duration

- Total therapy: 10-14 days
- IV therapy: 5-10 days until clinical improvement
- Oral step-down: When able to swallow and afebrile 48 hours
- Severe cases: 14-21 days total
- Post-surgical drainage: 7-10 days

PRACTICAL EXERCISES

Exercise 1: Classic Presentation

A 35-year-old with sore throat, fever, trismus, and unilateral neck swelling. CT shows parapharyngeal abscess. Empiric antibiotic?

Exercise 2: Dental Source

Patient with parapharyngeal abscess following tooth extraction. Which pathogens should empiric therapy cover?

Exercise 3: MRSA Risk

Healthcare worker with parapharyngeal abscess and recent MRSA exposure. Modify empiric regimen?

Exercise 4: Penicillin Allergy

Patient allergic to penicillin develops parapharyngeal abscess. Alternative to ampicillin-sulbactam?

Exercise 5: Pediatric Dosing

A 30kg child needs clindamycin for parapharyngeal abscess. Calculate IV dose.

Exercise 6: Step-down Decision

Patient improving on IV ampicillin-sulbactam after 7 days. Afebrile, swallowing well. Oral option?

Exercise 7: Duration Question

Patient completed 10 days therapy for parapharyngeal abscess. Symptoms resolved. Continue treatment?

Exercise 8: Treatment Failure

No improvement after 72 hours of appropriate antibiotics. Persistent fever and swelling. Next steps?

Exercise 9: Airway Concern

Patient with parapharyngeal abscess develops stridor and difficulty breathing. Priority intervention?

Exercise 10: Anaerobic Coverage

Why is anaerobic coverage essential in parapharyngeal abscess treatment?

Exercise 11: Surgical Timing

When should surgical drainage be considered for parapharyngeal abscess?

Exercise 12: Complications

Patient with parapharyngeal abscess develops chest pain and difficulty swallowing. Possible complication?

Clinical Pearl: Parapharyngeal abscess is an airway emergency. Secure airway first if compromise present, then start broad-spectrum antibiotics covering oral flora. Most cases require surgical drainage in addition to antibiotic therapy.

Parotitis/Sialadenitis

Parotitis/sialadenitis is inflammation of salivary glands, most commonly affecting the parotid glands. Acute bacterial sialadenitis presents with painful gland swelling, fever, and purulent discharge from ductal opening. Many cases are viral (mumps) requiring only supportive care, while bacterial infections need antibiotic therapy.

Common Pathogens

- Staphylococcus aureus (most common bacterial, including MRSA)
- Streptococcus viridans group
- Streptococcus pyogenes (Group A Strep)
- Haemophilus influenzae
- Anaerobes (Prevotella, Peptostreptococcus)
- Viral (mumps, parainfluenza, EBV - no antibiotics needed)

Antibiotic Choices

1. Empiric Therapy - Outpatient

First-line:

- Clindamycin 300-450mg PO QID
- Amoxicillin-clavulanate 875/125mg PO BID

Second-line:

- Azithromycin 500mg PO daily × 3 days
- Doxycycline 100mg PO BID

2. Empiric Therapy - Inpatient

First-line:

- Ampicillin-sulbactam 3g IV Q6H
- Clindamycin 600-900mg IV Q8H

3. MRSA Risk

Add vancomycin:

- Vancomycin 15-20mg/kg IV Q8-12H

4. Targeted Therapy

MSSA:

- Cephalexin 500mg PO QID or nafcillin 2g IV Q4H

MRSA:

- Clindamycin 300-450mg PO QID or vancomycin 15-20mg/kg IV Q8-12H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Ampicillin-sulbactam	3g	200mg/kg/day	Q6H
Clindamycin	600-900mg	40mg/kg/day	Q8H
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Nafcillin	2g	200mg/kg/day	Q4H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Clindamycin	300-450mg	30mg/kg/day	QID
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Azithromycin	500mg	10mg/kg/day	Daily
Doxycycline	100mg	4mg/kg/day	BID
Cephalexin	500mg	50mg/kg/day	QID

3. Renal Adjustments

- Amoxicillin-clavulanate: Reduce dose if CrCl <30
- Vancomycin: Dose based on levels and CrCl
- Clindamycin: No adjustment needed
- Doxycycline: No adjustment needed

Organism Coverage

- Clindamycin: S. aureus (including some MRSA), streptococci, anaerobes
- Amoxicillin-clavulanate: S. aureus, streptococci, anaerobes, H. influenzae
- Azithromycin: S. aureus, streptococci, H. influenzae
- Vancomycin: MRSA, MSSA, streptococci
- Ampicillin-sulbactam: Broad coverage including anaerobes

Contraindications

- Clindamycin: Previous C. diff infection (relative)
- Amoxicillin-clavulanate: Severe penicillin allergy
- Doxycycline: Pregnancy, children <8 years
- Vancomycin: Red man syndrome history (relative)

Adverse Effects

- Clindamycin: C. diff colitis, GI upset
- Amoxicillin-clavulanate: GI upset, allergic reactions
- Azithromycin: QT prolongation, GI upset
- Doxycycline: Photosensitivity, esophagitis

Drug Interactions

- Clindamycin: Warfarin (↑ INR)
- Azithromycin: QT-prolonging drugs, warfarin
- Doxycycline: Antacids (↓ absorption), warfarin
- Vancomycin: Aminoglycosides (↑ nephrotoxicity)

Treatment Duration

- Acute bacterial: 7-10 days
- Severe/hospitalized: 10-14 days
- Chronic/recurrent: 10-14 days
- IV therapy: 3-7 days until improvement, then oral
- Viral parotitis: No antibiotics needed

PRACTICAL EXERCISES

Exercise 1: Typical Bacterial Case

A 45-year-old with unilateral parotid swelling, fever, and purulent discharge from Stensen's duct. Outpatient antibiotic choice?

Exercise 2: Viral vs Bacterial

How do you distinguish viral from bacterial parotitis clinically?

Exercise 3: MRSA Risk

Nursing home resident with parotitis and recent MRSA infection. Outpatient antibiotic with MRSA coverage?

Exercise 4: Pediatric Dosing

A 25kg child needs clindamycin for bacterial parotitis. Calculate oral dose.

Exercise 5: Hospitalized Case

Elderly diabetic with severe parotitis, fever 102°F, unable to eat. IV empiric therapy?

Exercise 6: Penicillin Allergy

Patient allergic to penicillin develops bacterial parotitis. Alternative to amoxicillin-clavulanate?

Exercise 7: Duration Decision

Patient completed 7 days of clindamycin for parotitis. Symptoms resolved. Continue treatment?

Exercise 8: Treatment Failure

No improvement after 72 hours of appropriate antibiotics. Persistent swelling and fever. Next steps?

Exercise 9: Chronic Case

Patient with recurrent parotitis episodes. Treatment approach for acute flare?

Exercise 10: Drug Interaction

Patient on warfarin develops parotitis. You prescribe clindamycin. Monitoring needed?

Exercise 11: Bilateral Swelling

Young adult with bilateral parotid swelling, low-grade fever, no purulent discharge. Most likely diagnosis?

Exercise 12: Step-down Therapy

Patient improving on IV ampicillin-sulbactam after 5 days. Ready for oral therapy. Best choice?

Clinical Pearl: Distinguish viral from bacterial parotitis by looking for purulent discharge from ductal opening and unilateral involvement - these suggest bacterial infection requiring antibiotics. Bilateral swelling without discharge is typically viral.

Pertussis

Pertussis is a highly contagious respiratory infection caused by Bordetella pertussis, characterized by prolonged paroxysmal cough with inspiratory "whoop." Early antibiotic treatment reduces transmission and may shorten symptoms if given within first 1-2 weeks. Treatment is primarily for infection control rather than symptom relief in established disease.

Common Pathogens

- Bordetella pertussis (classic whooping cough)
- Bordetella parapertussis (milder disease)

Antibiotic Choices

1. First-line Therapy

Azithromycin:

- Adults: 500mg day 1, then 250mg days 2-5
- Pediatric: 10mg/kg day 1, then 5mg/kg days 2-5

Clarithromycin:

- Adults: 500mg PO BID × 7 days
- Pediatric: 15mg/kg/day divided BID × 7 days

2. Second-line Therapy

Erythromycin:

- Adults: 500mg PO QID × 14 days
- Pediatric: 50mg/kg/day divided QID × 14 days

3. Alternative (if macrolide intolerant)

Trimethoprim-sulfamethoxazole:

- Adults: DS 1 tablet PO BID × 14 days
- Pediatric: 8mg/kg/day (TMP component) divided BID × 14 days

Standard Dosing

1. IV Antibiotics (severe cases)

Drug	Adult Dose	Pediatric Dose	Frequency
Azithromycin	500mg	10mg/kg	Daily
Erythromycin	500mg	50mg/kg/day	QID

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Azithromycin	500mg day 1, 250mg days 2-5	10mg/kg day 1, 5mg/kg days 2-5	Daily
Clarithromycin	500mg	15mg/kg/day	BID

Erythromycin	500mg	50mg/kg/day	QID
TMP-SMX	DS 1 tablet	8mg/kg/day (TMP)	BID

3. Renal Adjustments

- Azithromycin: No adjustment needed
- Clarithromycin: Reduce dose 50% if CrCl <30
- TMP-SMX: Avoid if CrCl <15
- Erythromycin: No adjustment needed

Organism Coverage

- Azithromycin: Bordetella species, excellent tissue penetration
- Clarithromycin: Bordetella species, good bioavailability
- Erythromycin: Bordetella species (original gold standard)
- TMP-SMX: Bordetella species (alternative coverage)

Contraindications

- Macrolides: QT prolongation, myasthenia gravis
- Erythromycin: Severe liver disease
- TMP-SMX: Severe renal failure, sulfa allergy
- Azithromycin: Previous allergic reaction

Adverse Effects

- Azithromycin: QT prolongation, GI upset
- Clarithromycin: QT prolongation, metallic taste
- Erythromycin: Severe GI upset, hepatotoxicity
- TMP-SMX: Hyperkalemia, skin reactions

Drug Interactions

- Macrolides: QT-prolonging drugs, warfarin, digoxin
- Erythromycin: Many drug interactions via CYP3A4
- Clarithromycin: Similar to erythromycin but fewer
- TMP-SMX: Warfarin (↑ INR), methotrexate

Treatment Duration

- Azithromycin: 5 days
- Clarithromycin: 7 days
- Erythromycin: 14 days
- TMP-SMX: 14 days
- Post-exposure prophylaxis: Same durations
- Isolation: Until 5 days of appropriate antibiotics completed

PRACTICAL EXERCISES

Exercise 1: Classic Presentation

A 8-year-old with 2 weeks of paroxysmal cough with inspiratory whoop. PCR confirms pertussis. First-line treatment?

Exercise 2: Adult Case

A 45-year-old healthcare worker with confirmed pertussis, day 10 of illness. Still needs treatment?

Exercise 3: Infant Case

A 2-month-old with apneic episodes and positive pertussis PCR. Antibiotic choice?

Exercise 4: Macrolide Allergy

Patient with pertussis has documented azithromycin allergy. Alternative therapy?

Exercise 5: Household Contact

Spouse of pertussis patient asks about prophylaxis. Recommendation?

Exercise 6: Pediatric Dosing

A 20kg child needs azithromycin for pertussis. Calculate 5-day course.

Exercise 7: Duration Question

Patient completed 5 days of azithromycin for pertussis. Cough persists. Continue antibiotics?

Exercise 8: Pregnancy

Pregnant woman in third trimester exposed to pertussis. Prophylaxis choice?

Exercise 9: School Exposure

Teacher diagnosed with pertussis. When can they return to work?

Exercise 10: Late Presentation

Patient with 6-week history of persistent cough, pertussis PCR positive. Treatment indicated?

Exercise 11: QT Prolongation

Patient with known QT prolongation needs pertussis treatment. Safest option?

Exercise 12: Erythromycin Intolerance

Child cannot tolerate erythromycin due to severe nausea. Alternative macrolide?

Clinical Pearl: Antibiotics for pertussis are primarily for infection control, not symptom relief. Treat all cases regardless of symptom duration to reduce transmission. Isolation ends after 5 days of appropriate antibiotics.

Sinusitis (Acute)

Acute sinusitis is inflammation of paranasal sinuses lasting <4 weeks, most commonly viral and self-resolving. Bacterial sinusitis is diagnosed by persistent symptoms >10 days, worsening after initial improvement, or severe symptoms with fever >102°F. Antibiotics should be reserved for bacterial cases meeting specific criteria.

Common Pathogens

- Streptococcus pneumoniae (most common bacterial)
- Haemophilus influenzae (non-typeable)
- Moraxella catarrhalis
- Streptococcus pyogenes (Group A Strep)
- Staphylococcus aureus (chronic cases)
- Viral pathogens (majority of cases - no antibiotics needed)

Antibiotic Choices

1. First-line Therapy

Amoxicillin-clavulanate:

- Adults: 875/125mg PO BID
- Pediatric: 90mg/kg/day divided BID

2. High-dose for Resistant Pneumococcus

Amoxicillin-clavulanate high-dose:

- Adults: 2000/125mg PO BID
- Pediatric: 90mg/kg/day divided BID

3. Penicillin Allergy

Doxycycline:

- Adults: 100mg PO BID
- Not for children <8 years

Azithromycin:

- Adults: 500mg day 1, then 250mg days 2-5
- Pediatric: 10mg/kg day 1, then 5mg/kg days 2-5

4. Severe/Hospitalized

Ampicillin-sulbactam:

- 3g IV Q6H

Standard Dosing

1. IV Antibiotics (severe cases)

Drug	Adult Dose	Pediatric Dose	Frequency
Ampicillin-sulbactam	3g	200mg/kg/day	Q6H
Ceftriaxone	1-2g	50-75mg/kg/day	Q24H
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Doxycycline	100mg	4mg/kg/day	BID
Azithromycin	500mg day 1, 250mg days 2-5	10mg/kg day 1, 5mg/kg days 2-5	Daily
Levofloxacin	750mg	16-20mg/kg/day	Daily
Clindamycin	300-450mg	30mg/kg/day	TID

3. Renal Adjustments

- Amoxicillin-clavulanate: Reduce dose if CrCl <30
- Levofloxacin: Reduce dose if CrCl <50
- Doxycycline: No adjustment needed
- Azithromycin: No adjustment needed

Organism Coverage

- Amoxicillin-clavulanate: S. pneumoniae, H. influenzae, M. catarrhalis
- Doxycycline: S. pneumoniae, H. influenzae, atypicals
- Azithromycin: S. pneumoniae, H. influenzae, atypicals
- Levofloxacin: Broad spectrum including resistant S. pneumoniae
- Clindamycin: S. pneumoniae, S. pyogenes, anaerobes

Contraindications

- Amoxicillin-clavulanate: Severe penicillin allergy
- Doxycycline: Pregnancy, children <8 years
- Levofloxacin: Tendon rupture history, myasthenia gravis
- Azithromycin: QT prolongation

Adverse Effects

- Amoxicillin-clavulanate: Diarrhea, GI upset
- Doxycycline: Photosensitivity, esophagitis
- Azithromycin: QT prolongation, GI upset
- Levofloxacin: Tendon rupture, QT prolongation

Drug Interactions

- Amoxicillin-clavulanate: Warfarin (mild ↑ INR)
- Doxycycline: Antacids (↓ absorption), warfarin
- Azithromycin: QT-prolonging drugs
- Levofloxacin: Warfarin (↑ INR), antacids

Treatment Duration

- Uncomplicated: 5-7 days
- Severe symptoms: 7-10 days
- Immunocompromised: 10-14 days
- Treatment failure: 10-14 days with different agent
- Most viral cases: No antibiotics needed

PRACTICAL EXERCISES

Exercise 1: Viral vs Bacterial

Patient with 5 days of nasal congestion, mild facial pressure, no fever. Rhinorrhea improving. Antibiotic needed?

Exercise 2: Bacterial Criteria

Patient with 12 days of purulent nasal discharge, facial pain, and low-grade fever. First-line treatment?

Exercise 3: Treatment Failure

Patient not improving after 5 days of amoxicillin-clavulanate. Next antibiotic choice?

Exercise 4: Penicillin Allergy

Adult allergic to penicillin with bacterial sinusitis. Alternative therapy?

Exercise 5: Pediatric Dosing

A 30kg child needs amoxicillin-clavulanate for sinusitis. Calculate daily dose.

Exercise 6: Duration Decision

Patient with uncomplicated bacterial sinusitis completed 5 days of treatment. Symptoms resolved. Continue?

Exercise 7: Severe Presentation

Patient with high fever, severe facial pain, and orbital swelling. Treatment approach?

Exercise 8: Resistant Pneumococcus

Area with high pneumococcal resistance. Modify empiric therapy?

Exercise 9: Pregnancy

Pregnant woman with bacterial sinusitis. Safest antibiotic choice?

Exercise 10: Chronic Case

Patient with symptoms >12 weeks, previous antibiotic courses. Pathogen consideration?

Exercise 11: Watchful Waiting

When is observation without antibiotics appropriate for acute sinusitis?

Exercise 12: Complications

Patient with sinusitis develops severe headache and altered mental status. Concern?

Clinical Pearl: Most acute sinusitis is viral. Reserve antibiotics for persistent symptoms >10 days, worsening after initial improvement, or severe symptoms with high fever. Duration of 5-7 days is adequate for most bacterial cases.

Thrush

Thrush is oral candidiasis presenting with white plaques on tongue and oral mucosa that can be wiped off, revealing erythematous base. Common in immunocompromised patients, infants, and those using inhaled steroids. Treatment involves antifungal medications, not antibiotics.

Common Pathogens

- Candida albicans (most common)
- Candida glabrata
- Candida tropicalis
- Candida krusei
- Candida parapsilosis

Antibiotic Choices

1. First-line Therapy

Nystatin oral suspension:

- Adults: 5mL (500,000 units) swish and swallow QID
- Infants: 2mL (200,000 units) QID

Clotrimazole troches:

- Adults: 10mg troche dissolved slowly 5 times daily

2. Second-line/Systemic Therapy

Fluconazole:

- Adults: 200mg loading dose, then 100mg daily
- Pediatric: 6mg/kg loading dose, then 3mg/kg daily

3. Refractory Cases

Itraconazole solution:

- Adults: 200mg daily without food

Posaconazole suspension:

- Adults: 400mg BID with food

Standard Dosing

1. IV Antifungals (severe/systemic)

Drug	Adult Dose	Pediatric Dose	Frequency
Fluconazole	400mg loading, then 200mg	12mg/kg loading, then 6mg/kg	Daily
Caspofungin	70mg loading, then 50mg	70mg/m² loading, then 50mg/m²	Daily
Micafungin	100mg	2mg/kg	Daily

2. Oral Antifungals

Drug	Adult Dose	Pediatric Dose	Frequency
Fluconazole	100-200mg	3-6mg/kg	Daily
Itraconazole	200mg	5mg/kg	Daily
Posaconazole	400mg	13mg/kg	BID
Nystatin	5mL (500,000	2mL (200,000	QID

	units)	units)	
Clotrimazole	10mg troche	Age >3: 10mg troche	5 times daily

3. Renal Adjustments

- Fluconazole: Reduce dose 50% if CrCl <50
- Itraconazole: No adjustment needed
- Nystatin: No adjustment needed
- Caspofungin: No adjustment needed

Organism Coverage

- Fluconazole: Most Candida species (not C. krusei, some C. glabrata)
- Itraconazole: Broad Candida coverage including azole-resistant
- Nystatin: All Candida species (topical action)
- Caspofungin: All Candida species including azole-resistant
- Posaconazole: Broad spectrum including azole-resistant Candida

Contraindications

- Fluconazole: QT prolongation, severe liver disease
- Itraconazole: Heart failure, severe liver disease
- Nystatin: None significant
- Azoles: Pregnancy (Category C/D)

Adverse Effects

- Fluconazole: Hepatotoxicity, QT prolongation

- Itraconazole: Heart failure, hepatotoxicity
- Nystatin: Minimal (topical irritation)
- Caspofungin: Hepatotoxicity, infusion reactions

Drug Interactions

- Fluconazole: Warfarin (↑ INR), phenytoin, cyclosporine
- Itraconazole: Many drug interactions, avoid with certain statins
- Posaconazole: Similar to itraconazole
- Nystatin: None significant

Treatment Duration

- Mild thrush: 7-14 days topical therapy
- Systemic fluconazole: 7-14 days
- Immunocompromised: 14-21 days
- Refractory cases: 2-4 weeks
- Continue 2-3 days after lesions resolve

PRACTICAL EXERCISES

Exercise 1: Typical Presentation

A 65-year-old on inhaled steroids develops white plaques on tongue that wipe off. First-line treatment?

Exercise 2: Infant Case

A 3-month-old breastfeeding infant with white patches in mouth. Treatment choice?

Exercise 3: Treatment Failure

Patient not responding to nystatin after 10 days. Next step?

Exercise 4: Immunocompromised

HIV patient with CD4 count 50 develops oral thrush. Treatment approach?

Exercise 5: Fluconazole Dosing

A 25kg child needs fluconazole for thrush. Calculate loading and maintenance doses.

Exercise 6: Duration Question

Patient with thrush completed 7 days of fluconazole. White plaques gone. Continue treatment?

Exercise 7: Drug Interaction

Patient on warfarin develops thrush. You prescribe fluconazole. Monitoring needed?

Exercise 8: Refractory Case

Multiple fluconazole courses failed. Alternative antifungal for resistant thrush?

Exercise 9: Pregnancy

Pregnant woman develops thrush. Safest treatment option?

Exercise 10: Denture-Related

Elderly patient with ill-fitting dentures has recurrent thrush. Management approach?

Exercise 11: Swallowing Difficulty

Patient with severe dysphagia cannot use swish-and-swallow medications. Alternative?

Exercise 12: Prevention

Patient using inhaled steroids asks about preventing thrush. Recommendations?

Clinical Pearl: Thrush requires antifungals, not antibiotics. Always look for underlying causes (steroids, diabetes, immunosuppression) and address predisposing factors to prevent recurrence.

Tonsillitis/Pharyngitis

Pharyngitis is throat inflammation that's mostly viral (80-90%) and self-limiting. Bacterial pharyngitis, primarily Group A Strep, requires antibiotic treatment to prevent complications like rheumatic fever. Use clinical criteria or rapid testing to distinguish bacterial from viral causes.

Common Pathogens

- Streptococcus pyogenes (Group A Strep - most important bacterial)
- Viral pathogens (majority - rhinovirus, adenovirus, EBV)
- Streptococcus groups C and G
- Mycoplasma pneumoniae
- Chlamydia pneumoniae
- Corynebacterium diphtheriae (rare)

Antibiotic Choices

1. First-line for Group A Strep

Penicillin V:

- Adults: 500mg PO BID-TID
- Pediatric: 250mg PO BID-TID

Amoxicillin (children):

- 50mg/kg/day divided BID (better taste)

2. Penicillin Allergy

Azithromycin:

- Adults: 500mg day 1, then 250mg days 2-5
- Pediatric: 12mg/kg daily × 5 days

Clindamycin:

- Adults: 300mg PO TID
- Pediatric: 20mg/kg/day divided TID

3. Severe/Hospitalized

Penicillin G:

- 2-4 million units IV Q4-6H

Ampicillin:

- Adults: 2g IV Q6H
- Pediatric: 200mg/kg/day IV Q6H

Standard Dosing

1. IV Antibiotics (severe cases)

Drug	Adult Dose	Pediatric Dose	Frequency
Penicillin G	2-4 million units	250,000 units/kg/day	Q4-6H
Ampicillin	2g	200mg/kg/day	Q6H

Clindamycin	600-900mg	40mg/kg/day	Q8H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Penicillin V	500mg	250mg	BID-TID
Amoxicillin	875mg	50mg/kg/day	BID
Azithromycin	500mg day 1, 250mg days 2-5	12mg/kg	Daily
Clindamycin	300mg	20mg/kg/day	TID
Erythromycin	500mg	40mg/kg/day	QID

3. Renal Adjustments

- Penicillin: Reduce dose if CrCl <30
- Amoxicillin: Reduce dose if CrCl <30
- Azithromycin: No adjustment needed
- Clindamycin: No adjustment needed

Organism Coverage

- Penicillin: Group A Strep (gold standard)
- Amoxicillin: Similar to penicillin
- Azithromycin: Strep, atypicals (Mycoplasma)
- Clindamycin: Strep, anaerobes
- Erythromycin: Strep, atypicals

Contraindications

- Penicillin: Severe penicillin allergy
- Azithromycin: QT prolongation
- Clindamycin: Previous C. diff infection (relative)
- Erythromycin: Severe liver disease

Adverse Effects

- Penicillin: Allergic reactions, GI upset
- Amoxicillin: Rash (especially with EBV), GI upset
- Azithromycin: QT prolongation, GI upset
- Clindamycin: C. diff colitis, GI upset

Drug Interactions

- Penicillin: Minimal interactions
- Azithromycin: QT-prolonging drugs
- Clindamycin: Warfarin (↑ INR)
- Erythromycin: Many CYP3A4 interactions

Treatment Duration

- Group A Strep: 10 days (penicillin/amoxicillin)
- Azithromycin: 5 days
- Clindamycin: 10 days
- Viral pharyngitis: No antibiotics needed
- Complete full course to prevent rheumatic fever

PRACTICAL EXERCISES

Exercise 1: Centor Criteria

Adult with sore throat, fever 101°F, tonsillar exudates, tender lymph nodes, no cough. Centor score and management?

Exercise 2: Pediatric Strep

6-year-old with positive rapid strep test. First-line antibiotic choice?

Exercise 3: Penicillin Allergy

Adult with confirmed strep throat has penicillin allergy (rash). Alternative therapy?

Exercise 4: Viral Pharyngitis

Young adult with sore throat, cough, rhinorrhea, low-grade fever. Rapid strep negative. Treatment?

Exercise 5: Amoxicillin Dosing

20kg child needs amoxicillin for strep throat. Calculate daily dose.

Exercise 6: Duration Compliance

Patient feels better after 5 days of penicillin for strep. Can they stop early?

Exercise 7: Mononucleosis

Teenager with sore throat, fever, lymphadenopathy. Monospot positive. Avoid which antibiotic?

Exercise 8: Treatment Failure

Patient not improving after 72 hours of appropriate strep treatment. Next steps?

Exercise 9: Recurrent Strep

Child with third episode of strep throat in 6 months. Same treatment approach?

Exercise 10: Azithromycin Course

Adult needs azithromycin for strep throat. Prescribe the 5-day regimen.

Exercise 11: Severe Presentation

Patient with strep throat, high fever, difficulty swallowing, dehydration. Treatment approach?

Exercise 12: Prevention

Family member of strep patient asks about prophylaxis. Recommendation?

Clinical Pearl: Reserve antibiotics for confirmed or highly suspected Group A Strep. Most sore throats are viral. Complete the full antibiotic course even if symptoms improve to prevent rheumatic fever.

CHAPTER 7: EYE INFECTIONS

Blepharitis

Blepharitis is eyelid margin inflammation causing redness, scaling, and irritation. Most cases are chronic and require long-term management with lid hygiene rather than antibiotics. Bacterial blepharitis may benefit from topical antibiotic therapy, while seborrheic blepharitis typically responds to hygiene measures alone.

Common Pathogens

- Staphylococcus aureus (bacterial blepharitis)
- Staphylococcus epidermidis
- Propionibacterium acnes
- Malassezia species (seborrheic)
- Demodex folliculorum (mites)

Antibiotic Choices

1. First-line Topical

Erythromycin ophthalmic ointment:

- 0.5% ointment applied to lid margins BID

Bacitracin ophthalmic ointment:

- Applied to lid margins BID

2. Second-line Topical

Azithromycin ophthalmic solution:

- 1% solution BID × 2 days, then daily

Tobramycin ophthalmic ointment:

- 0.3% ointment applied to lid margins BID

3. Oral Therapy (severe/chronic)

Doxycycline:

- 100mg PO daily × 1-3 months

Azithromycin:

- 500mg daily × 3 days, then 250mg 3 times weekly

Standard Dosing

1. IV Antibiotics (not typically used)

Drug	Adult Dose	Pediatric Dose	Frequency
Doxycycline	100mg	4mg/kg/day	Daily

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Doxycycline	100mg	4mg/kg/day	Daily
Azithromycin	500mg × 3 days, then 250mg	10mg/kg × 3 days, then 5mg/kg	3 times weekly

3. Topical Antibiotics

Drug	Adult/Pediatric Dose	Frequency	Duration
Erythromycin 0.5% ointment	Small ribbon to lid margins	BID	2-4 weeks
Bacitracin ointment	Small ribbon to lid margins	BID	2-4 weeks
Azithromycin 1% solution	1 drop to affected lid	BID × 2 days, then daily	4-6 weeks

4. Renal Adjustments

- Doxycycline: No adjustment needed
- Azithromycin: No adjustment needed
- Topical agents: No adjustment needed

Organism Coverage

- Erythromycin: Staphylococci, streptococci
- Bacitracin: Gram-positive bacteria including staphylococci
- Azithromycin: Staphylococci, anti-inflammatory properties
- Doxycycline: Broad spectrum, anti-inflammatory effects
- Tobramycin: Gram-negatives, some gram-positives

Contraindications

- Doxycycline: Pregnancy, children <8 years
- Azithromycin: QT prolongation
- Bacitracin: Known hypersensitivity
- Erythromycin: Viral infections of cornea/conjunctiva

Adverse Effects

- Topical antibiotics: Local irritation, allergic reactions
- Doxycycline: Photosensitivity, GI upset
- Azithromycin: GI upset, QT prolongation (oral)

Drug Interactions

- Doxycycline: Antacids (↓ absorption), warfarin
- Azithromycin: QT-prolonging drugs

- Topical agents: Minimal systemic interactions

Treatment Duration

- Topical antibiotics: 2-4 weeks
- Oral doxycycline: 1-3 months
- Azithromycin oral: 3 days loading, then maintenance
- Lid hygiene: Ongoing daily
- Chronic management: Long-term hygiene measures

PRACTICAL EXERCISES

Exercise 1: Typical Presentation

Patient with red, scaly eyelid margins and crusting. No discharge. First-line treatment?

Exercise 2: Bacterial vs Seborrheic

How do you distinguish bacterial from seborrheic blepharitis?

Exercise 3: Topical Choice

Patient with mild bacterial blepharitis. Preferred topical antibiotic?

Exercise 4: Chronic Case

Patient with recurrent blepharitis despite topical therapy. Next treatment approach?

Exercise 5: Pediatric Case

8-year-old with bacterial blepharitis. Safe antibiotic options?

Exercise 6: Duration Question

Patient used erythromycin ointment for 2 weeks. Symptoms improved. Continue treatment?

Exercise 7: Contact Lens Wearer

Contact lens user with blepharitis. Treatment modifications?

Exercise 8: Allergy History

Patient allergic to penicillin develops blepharitis. Safe topical option?

Exercise 9: Treatment Failure

No improvement after 4 weeks of topical antibiotics. Next step?

Exercise 10: Oral Therapy

When should oral antibiotics be considered for blepharitis?

Exercise 11: Hygiene Measures

What non-antibiotic treatments are essential for blepharitis?

Exercise 12: Recurrence Prevention

Patient asks about preventing blepharitis recurrence. Key recommendations?

Clinical Pearl: Most blepharitis responds to lid hygiene alone. Reserve antibiotics for clearly bacterial cases with purulent discharge. Chronic management requires ongoing hygiene measures rather than continuous antibiotics.

Conjunctivitis

Conjunctivitis is inflammation of the conjunctiva causing red, irritated eyes with discharge. Most cases are viral and

self-resolving, but bacterial conjunctivitis requires topical antibiotic therapy. Purulent discharge suggests bacterial etiology, while watery discharge typically indicates viral cause.

Common Pathogens

- Staphylococcus aureus (bacterial)
- Streptococcus pneumoniae (bacterial)
- Haemophilus influenzae (bacterial, especially children)
- Moraxella catarrhalis (bacterial)
- Adenovirus (viral - most common overall)
- Chlamydia trachomatis (neonates, sexually active adults)
- Neisseria gonorrhoeae (hyperacute, sexually transmitted)

Antibiotic Choices

1. First-line Topical

Erythromycin ophthalmic ointment:

- 0.5% ointment 1-2cm ribbon QID

Polymyxin B/trimethoprim drops:

- 1-2 drops QID

2. Second-line Topical

Azithromycin ophthalmic solution:

- 1% solution 1 drop BID × 2 days, then daily

Ciprofloxacin ophthalmic solution:

- 0.3% solution 1-2 drops Q2H × 2 days, then QID

3. Special Situations

Gonococcal conjunctivitis:

- Ceftriaxone 1g IM single dose PLUS topical therapy

Chlamydial conjunctivitis:

- Azithromycin 1g PO single dose PLUS topical therapy

Standard Dosing

1. IV Antibiotics (hyperacute cases)

Drug	Adult Dose	Pediatric Dose	Frequency
Ceftriaxone	1g	50mg/kg	Single dose IM

2. Oral Antibiotics (systemic infections)

Drug	Adult Dose	Pediatric Dose	Frequency
Azithromycin	1g	20mg/kg	Single dose
Doxycycline	100mg	4mg/kg/day	BID

3. Topical Antibiotics

Drug	Adult/Pediatric Dose	Frequency	Duration
Erythromycin 0.5% ointment	1-2cm ribbon	QID	5-7 days
Polymyxin B/trimethoprim	1-2 drops	QID	5-7 days
Azithromycin 1% solution	1 drop	BID × 2 days, then daily	5-7 days
Ciprofloxacin 0.3%	1-2 drops	Q2H × 2 days, then QID	5-7 days

4. Renal Adjustments

- Topical agents: No adjustment needed
- Oral azithromycin: No adjustment needed
- Doxycycline: No adjustment needed

Organism Coverage

- Erythromycin: Staphylococci, streptococci, chlamydia
- Polymyxin B/trimethoprim: Gram-positives and gram-negatives
- Azithromycin: Broad spectrum including chlamydia
- Ciprofloxacin: Excellent gram-negative coverage, good gram-positive
- Ceftriaxone: Gonococci, broad gram-negative coverage

Contraindications

- Fluoroquinolones: Children <1 year (topical safe)
- Doxycycline: Pregnancy, children <8 years
- Polymyxin B: Known hypersensitivity
- Erythromycin: Viral infections of cornea/conjunctiva

Adverse Effects

- Topical antibiotics: Local irritation, burning, stinging
- Azithromycin oral: GI upset
- Doxycycline: Photosensitivity, GI upset
- Ceftriaxone: Injection site pain

Drug Interactions

- Topical agents: Minimal systemic interactions
- Oral azithromycin: QT-prolonging drugs
- Doxycycline: Antacids (↓ absorption)

Treatment Duration

- Bacterial conjunctivitis: 5-7 days topical
- Viral conjunctivitis: No antibiotics needed
- Gonococcal: Single dose systemic + 5-7 days topical
- Chlamydial: Single dose systemic + topical therapy
- Most cases resolve within 7-10 days

PRACTICAL EXERCISES

Exercise 1: Viral vs Bacterial

Patient with bilateral red eyes, watery discharge, recent URI symptoms. Treatment approach?

Exercise 2: Bacterial Conjunctivitis

Child with unilateral red eye and thick purulent discharge. First-line topical therapy?

Exercise 3: Contact Lens Wearer

Contact lens user with acute red eye and discharge. Antibiotic choice?

Exercise 4: Neonatal Conjunctivitis

3-week-old with purulent eye discharge. Consider which pathogens?

Exercise 5: Duration Question

Patient completed 5 days of erythromycin ointment. Eyes clear. Continue treatment?

Exercise 6: Treatment Failure

No improvement after 5 days of polymyxin B/trimethoprim. Next step?

Exercise 7: Hyperacute Presentation

Young adult with severe purulent discharge, lid swelling, sexual history. Likely pathogen and treatment?

Exercise 8: Allergy History

Patient allergic to sulfa drugs needs conjunctivitis treatment. Safe options?

Exercise 9: Pregnancy

Pregnant woman with bacterial conjunctivitis. Safest topical antibiotic?

Exercise 10: Bilateral Involvement

Adult with bilateral conjunctivitis and urethral discharge. Additional testing needed?

Exercise 11: School-age Child

6-year-old with "pink eye" asks when they can return to school. Guidance?

Exercise 12: Recurrent Cases

Patient with frequent conjunctivitis episodes. Management approach?

Clinical Pearl: Most conjunctivitis is viral and doesn't need antibiotics. Purulent discharge suggests bacterial infection requiring topical therapy. Reserve systemic antibiotics for gonococcal, chlamydial, or neonatal cases.

Corneal Abrasion

Corneal abrasion is a superficial scratch on the corneal epithelium causing severe pain, tearing, and photophobia. Most heal within 24-72 hours with conservative management and prophylactic topical antibiotics. Contact lens-related abrasions have higher infection risk and require anti-pseudomonal coverage.

Common Pathogens

- Staphylococcus aureus (most common secondary infection)
- Streptococcus pneumoniae
- Pseudomonas aeruginosa (contact lens wearers)
- Serratia marcescens (contact lens related)
- Haemophilus influenzae

Antibiotic Choices

1. Non-Contact Lens Related

First-line:

- Erythromycin 0.5% ophthalmic ointment QID
- Polymyxin B/trimethoprim drops QID

Second-line:

- Azithromycin 1% solution BID

2. Contact Lens Related

First-line:

- Ciprofloxacin 0.3% drops Q2H while awake
- Ofloxacin 0.3% drops Q2H while awake

Second-line:

- Tobramycin 0.3% drops Q2H while awake

3. Large/High-Risk Abrasions

- Moxifloxacin 0.5% drops Q2H while awake

Standard Dosing

1. IV Antibiotics (not typically used)

Drug	Adult Dose	Pediatric Dose	Frequency
Ciprofloxacin	400mg	30mg/kg/day	Q12H

2. Oral Antibiotics (severe infections only)

Drug	Adult Dose	Pediatric Dose	Frequency
Ciprofloxacin	500-750mg	30mg/kg/day	Q12H
Doxycycline	100mg	4mg/kg/day	BID

3. Topical Antibiotics

Drug	Adult/Pediatric Dose	Frequency	Duration
Erythromycin 0.5% ointment	1-2cm ribbon	QID	3-5 days
Ciprofloxacin 0.3% drops	1-2 drops	Q2H while awake	3-5 days
Polymyxin B/trimethoprim	1-2 drops	QID	3-5 days
Azithromycin 1% solution	1 drop	BID	3-5 days

4. Renal Adjustments

- Topical agents: No adjustment needed
- Oral ciprofloxacin: Reduce dose 50% if CrCl <30
- Doxycycline: No adjustment needed

Organism Coverage

- Erythromycin: Gram-positives, some gram-negatives
- Ciprofloxacin: Excellent Pseudomonas and gram-negative coverage
- Polymyxin B/trimethoprim: Broad gram-positive and gram-negative
- Azithromycin: Gram-positives, some gram-negatives
- Tobramycin: Gram-negatives including Pseudomonas

Contraindications

- Fluoroquinolones: Avoid in children <1 year (topical generally safe)
- Doxycycline: Pregnancy, children <8 years
- Polymyxin B: Known hypersensitivity
- Contact lenses: Discontinue during treatment

Adverse Effects

- Topical antibiotics: Burning, stinging, blurred vision
- Fluoroquinolone drops: Local irritation
- Erythromycin ointment: Temporary vision blurring
- Oral antibiotics: GI upset, photosensitivity (doxycycline)

Drug Interactions

- Topical agents: Minimal systemic interactions
- Oral ciprofloxacin: Warfarin (↑ INR), antacids
- Doxycycline: Antacids (↓ absorption)

Treatment Duration

- Simple abrasions: 3-5 days topical prophylaxis
- Contact lens related: 5-7 days anti-pseudomonal therapy
- Large abrasions (>5mm): 5-7 days
- High-risk patients: 5-7 days
- Follow-up: 24-48 hours to ensure healing

PRACTICAL EXERCISES

Exercise 1: Simple Abrasion

Patient scratched eye with fingernail. Small corneal abrasion on fluorescein staining. No contact lens use. Prophylactic antibiotic?

Exercise 2: Contact Lens Wearer

Contact lens user with corneal abrasion after removing stuck lens. Antibiotic choice?

Exercise 3: Large Abrasion

Patient with 6mm corneal abrasion from tree branch. Antibiotic selection?

Exercise 4: Pediatric Case

5-year-old with corneal abrasion from toy. Safe antibiotic options?

Exercise 5: Duration Decision

Patient with simple abrasion completed 3 days of erythromycin ointment. Pain resolved. Continue treatment?

Exercise 6: Treatment Failure

Contact lens wearer not improving after 48 hours of ciprofloxacin. Next step?

Exercise 7: Ointment vs Drops

Patient prefers drops over ointment due to vision blurring. Alternative to erythromycin ointment?

Exercise 8: High-Risk Patient

Diabetic with large corneal abrasion. Antibiotic approach?

Exercise 9: Pain Management

Patient with corneal abrasion asks about pain relief. In addition to antibiotics, what else?

Exercise 10: Follow-up Timing

When should patient with corneal abrasion return for evaluation?

Exercise 11: Work Restriction

Construction worker with corneal abrasion asks about returning to work. Guidance?

Exercise 12: Recurrent Abrasions

Patient with history of recurrent corneal erosions. Prophylaxis approach?

Clinical Pearl: Most corneal abrasions are sterile injuries requiring only prophylactic antibiotics. Contact lens wearers need anti-pseudomonal coverage. Never use topical anesthetics for treatment as they delay healing.

Orbital Cellulitis

Orbital cellulitis is a sight-threatening infection of tissues posterior to the orbital septum, presenting with proptosis, extraocular muscle limitation, and vision changes. It requires immediate IV antibiotics and ophthalmology consultation to prevent blindness and intracranial extension. Distinguished from preseptal cellulitis by presence of proptosis and ocular motility deficits.

Common Pathogens

- Streptococcus pneumoniae (most common)
- Staphylococcus aureus (including MRSA)
- Streptococcus pyogenes (Group A Strep)
- Haemophilus influenzae (unvaccinated children)
- Anaerobes (dental source, chronic sinusitis)
- Gram-negative bacilli (immunocompromised)

Antibiotic Choices

1. Empiric Therapy

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q24H

Second-line:

- Ampicillin-sulbactam 3g IV Q6H PLUS vancomycin 15-20mg/kg IV Q8-12H

2. Targeted Therapy

S. pneumoniae:

- Ceftriaxone 2g IV Q24H (or vancomycin if resistant)

MRSA:

- Vancomycin 15-20mg/kg IV Q8-12H or linezolid 600mg IV Q12H

Anaerobic source:

- Clindamycin 600-900mg IV Q8H PLUS ceftriaxone 2g IV Q24H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Ceftriaxone	2g	100mg/kg/day	Q24H

Ampicillin-sulbactam	3g	200mg/kg/day	Q6H
Clindamycin	600-900mg	40mg/kg/day	Q8H
Linezolid	600mg	30mg/kg/day	Q12H

2. Oral Antibiotics (step-down therapy)

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Clindamycin	300-450mg	30mg/kg/day	QID
Linezolid	600mg	30mg/kg/day	Q12H
Ciprofloxacin	750mg	30mg/kg/day	Q12H

3. Renal Adjustments

- Vancomycin: Dose based on levels and CrCl
- Ceftriaxone: No adjustment unless CrCl <10
- Ampicillin-sulbactam: Reduce dose if CrCl <30
- Linezolid: No adjustment needed

Organism Coverage

- Vancomycin: MRSA, MSSA, resistant S. pneumoniae
- Ceftriaxone: S. pneumoniae, H. influenzae, gram-negatives
- Ampicillin-sulbactam: Broad spectrum including anaerobes
- Clindamycin: Gram-positives, excellent anaerobic coverage
- Linezolid: MRSA, MSSA, Streptococci

Contraindications

- Vancomycin: Red man syndrome history (relative)
- Ceftriaxone: Severe penicillin allergy (relative)
- Linezolid: MAO inhibitor use
- Clindamycin: Previous C. diff infection (relative)

Adverse Effects

- Vancomycin: Nephrotoxicity, ototoxicity, red man syndrome
- Ceftriaxone: Allergic reactions, C. diff colitis
- Linezolid: Thrombocytopenia, peripheral neuropathy
- Clindamycin: C. diff colitis, GI upset

Drug Interactions

- Vancomycin: Aminoglycosides (↑ nephrotoxicity)
- Linezolid: SSRIs, tyramine-rich foods
- Clindamycin: Warfarin (↑ INR)
- Ceftriaxone: Minimal significant interactions

Treatment Duration

- Total therapy: 10-14 days
- IV therapy: 5-10 days until clinical improvement
- Oral step-down: When vision stable and inflammation resolving
- Severe cases: 14-21 days total
- Post-surgical: 7-14 days depending on procedure

PRACTICAL EXERCISES

Exercise 1: Classic Presentation

Child with fever, proptosis, limited eye movement, and decreased vision. CT shows orbital inflammation. Empiric therapy?

Exercise 2: MRSA Risk

Patient with orbital cellulitis and recent MRSA skin infection. Modify empiric regimen?

Exercise 3: Sinusitis Source

Adult with orbital cellulitis secondary to ethmoid sinusitis. Antibiotic considerations?

Exercise 4: Pediatric Dosing

25kg child needs vancomycin for orbital cellulitis. Calculate dose.

Exercise 5: Step-down Decision

Patient improving on IV vancomycin/ceftriaxone after 7 days. Vision stable. Oral options?

Exercise 6: Treatment Failure

No improvement after 72 hours of appropriate antibiotics. Next steps?

Exercise 7: Anaerobic Source

Orbital cellulitis following dental abscess. Modify antibiotic coverage?

Exercise 8: Duration Question

Patient completed 10 days therapy. Proptosis resolved, vision normal. Continue treatment?

Exercise 9: Surgical Indication

When should surgical drainage be considered for orbital cellulitis?

Exercise 10: Complications

Patient develops worsening vision and severe headache. Concern and management?

Exercise 11: Penicillin Allergy

Patient with severe penicillin allergy develops orbital cellulitis. Alternative regimen?

Exercise 12: Preseptal vs Orbital

How do you distinguish preseptal from orbital cellulitis clinically?

Clinical Pearl: Orbital cellulitis is an ophthalmologic emergency requiring immediate IV antibiotics and urgent ophthalmology consultation. Any vision changes or extraocular movement limitation demands aggressive treatment to prevent blindness.

Periorbital/Preseptal Cellulitis

Periorbital (preseptal) cellulitis is infection of eyelid and periorbital tissues anterior to the orbital septum. It presents with eyelid swelling and erythema but normal vision, eye movement, and no proptosis. Most cases can be treated with oral antibiotics, unlike orbital cellulitis which requires IV therapy.

Common Pathogens

- Staphylococcus aureus (most common, including MRSA)
- Streptococcus pyogenes (Group A Strep)
- Streptococcus pneumoniae
- Haemophilus influenzae (unvaccinated children)

Antibiotic Choices

1. Mild Cases (Outpatient)

First-line:

- Amoxicillin-clavulanate 875/125mg PO BID
- Clindamycin 300-450mg PO QID

Second-line:

- Azithromycin 500mg day 1, then 250mg days 2-5
- Doxycycline 100mg PO BID

2. Severe Cases (Inpatient)

First-line:

- Ceftriaxone 2g IV Q24H
- Ampicillin-sulbactam 3g IV Q6H

MRSA Risk:

- Vancomycin 15-20mg/kg IV Q8-12H PLUS ceftriaxone 2g IV Q24H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Ceftriaxone	2g	50-75mg/kg/day	Q24H
Ampicillin-sulbactam	3g	200mg/kg/day	Q6H
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Clindamycin	600-900mg	40mg/kg/day	Q8H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Clindamycin	300-450mg	30mg/kg/day	QID
Azithromycin	500mg day 1, 250mg days 2-5	10mg/kg day 1, 5mg/kg days 2-5	Daily
Doxycycline	100mg	4mg/kg/day	BID
Cephalexin	500mg	50mg/kg/day	QID

3. Renal Adjustments

- Amoxicillin-clavulanate: Reduce dose if CrCl <30
- Vancomycin: Dose based on levels and CrCl
- Ceftriaxone: No adjustment unless CrCl <10

- Clindamycin: No adjustment needed

Organism Coverage

- Amoxicillin-clavulanate: S. aureus, Streptococci, H. influenzae
- Clindamycin: S. aureus (including some MRSA), Streptococci
- Ceftriaxone: S. pneumoniae, H. influenzae, Streptococci
- Vancomycin: MRSA, MSSA, Streptococci
- Azithromycin: S. aureus, Streptococci, H. influenzae

Contraindications

- Amoxicillin-clavulanate: Severe penicillin allergy
- Doxycycline: Pregnancy, children <8 years
- Clindamycin: Previous C. diff infection (relative)
- Vancomycin: Red man syndrome history (relative)

Adverse Effects

- Amoxicillin-clavulanate: GI upset, allergic reactions
- Clindamycin: C. diff colitis, GI upset
- Doxycycline: Photosensitivity, esophagitis
- Vancomycin: Nephrotoxicity, ototoxicity

Drug Interactions

- Amoxicillin-clavulanate: Warfarin (mild ↑ INR)
- Clindamycin: Warfarin (↑ INR)
- Doxycycline: Antacids (↓ absorption), warfarin
- Azithromycin: QT-prolonging drugs

Treatment Duration

- Mild cases: 7-10 days oral therapy
- Severe cases: 10-14 days (IV then oral)
- IV therapy: 3-5 days until improvement, then oral
- MRSA cases: 10-14 days
- Follow-up: 24-48 hours to ensure no progression to orbital cellulitis

PRACTICAL EXERCISES

Exercise 1: Typical Presentation

Child with eyelid swelling and redness, normal vision and eye movement. No proptosis. Outpatient antibiotic choice?

Exercise 2: MRSA Risk

Healthcare worker with preseptal cellulitis and recent MRSA exposure. Oral antibiotic with MRSA coverage?

Exercise 3: Severe Presentation

Patient with extensive preseptal cellulitis, fever, unable to open eye due to swelling. Treatment approach?

Exercise 4: Pediatric Dosing

20kg child needs amoxicillin-clavulanate for preseptal cellulitis. Calculate dose.

Exercise 5: Penicillin Allergy

Adult allergic to penicillin develops preseptal cellulitis. Alternative oral therapy?

Exercise 6: Duration Decision

Patient completed 7 days of clindamycin. Swelling resolved. Continue treatment?

Exercise 7: Treatment Failure

No improvement after 48 hours of oral antibiotics. Next step?

Exercise 8: Progression Concern

Patient develops eye pain and double vision during treatment. Management?

Exercise 9: Step-down Therapy

Patient improving on IV ceftriaxone after 4 days. Ready for oral therapy. Best choice?

Exercise 10: Trauma-Related

Preseptal cellulitis following eyelid laceration repair. Antibiotic considerations?

Exercise 11: Hospitalization Criteria

When should preseptal cellulitis be treated as inpatient?

Exercise 12: Prevention

Patient asks about preventing recurrent preseptal cellulitis. Recommendations?

Clinical Pearl: Always assess for orbital cellulitis signs (proptosis, limited eye movement, vision changes). Preseptal cellulitis has normal vision and eye movement - any changes warrant immediate ophthalmology evaluation.

CHAPTER 8: GASTROINTESTINAL INFECTIONS

Appendicitis

Appendicitis is inflammation of the vermiform appendix requiring surgical removal or antibiotic therapy. Antibiotics are used for perioperative prophylaxis, complicated appendicitis, or non-operative management. Treatment targets enteric gram-negative bacteria and anaerobes.

Common Pathogens

- Escherichia coli (m ost common)
- Bacteroides fragilis (anaerobic)
- Pseudomonas aeruginosa
- Enterococcus species
- Klebsiella pneumoniae
- Peptostreptococcus species

Antibiotic Choices

1. Uncomplicated Appendicitis

Prophylaxis (single dose):

- Cefazolin 2g IV PLUS metronidazole 500mg IV

Non-operative management:

- Amoxicillin-clavulanate 875/125mg PO BID

2. Complicated Appendicitis

First-line:

- Piperacillin-tazobactam 4.5g IV Q6H
- Ceftriaxone 2g IV Q24H PLUS metronidazole 500mg IV Q8H

Second-line:

- Meropenem 1g IV Q8H
- Ciprofloxacin 400mg IV Q12H PLUS metronidazole 500mg IV Q8H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Piperacillin-tazobactam	4.5g	300mg/kg/day	Q6H
Ceftriaxone	2g	75mg/kg/day	Q24H
Metronidazole	500mg	30mg/kg/day	Q8H
Meropenem	1g	60mg/kg/day	Q8H
Ciprofloxacin	400mg	30mg/kg/day	Q12H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Metronidazole	500mg	30mg/kg/day	TID

Clindamycin	450mg	30mg/kg/day	QID

3. Renal Adjustments

- Piperacillin-tazobactam: Reduce dose if CrCl <40
- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Meropenem: Reduce dose if CrCl <50
- Metronidazole: No adjustment needed

Organism Coverage

- Piperacillin-tazobactam: Broad spectrum including Pseudomonas, anaerobes
- Ceftriaxone: Gram-negatives, some gram-positives
- Metronidazole: Excellent anaerobic coverage
- Meropenem: Broad spectrum including resistant gram-negatives
- Ciprofloxacin: Gram-negatives, limited gram-positive coverage

Contraindications

- Fluoroquinolones: Tendon rupture history, myasthenia gravis
- Beta-lactams: Severe penicillin allergy
- Metronidazole: Alcohol use (disulfiram reaction)
- Meropenem: Severe carbapenem allergy

Adverse Effects

- Piperacillin-tazobactam: Allergic reactions, C. diff colitis
- Metronidazole: Metallic taste, peripheral neuropathy
- Ciprofloxacin: Tendon rupture, QT prolongation

- Meropenem: Seizures (high doses), allergic reactions

Drug Interactions

- Metronidazole: Warfarin (↑ INR), alcohol (disulfiram reaction)
- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Piperacillin-tazobactam: Warfarin (↑ INR)
- Meropenem: Valproic acid (↓ levels)

Treatment Duration

- Prophylaxis: Single dose pre-operatively
- Uncomplicated (non-operative): 7-10 days
- Complicated appendicitis: 5-7 days IV, then oral to complete 7-14 days
- Abscess formation: 14-21 days total
- Post-operative complicated: 3-5 days

PRACTICAL EXERCISES

Exercise 1: Uncomplicated Surgery

Patient undergoing laparoscopic appendectomy for uncomplicated appendicitis. Prophylaxis regimen?

Exercise 2: Complicated Case

Patient with perforated appendicitis and abscess. Empiric IV antibiotic choice?

Exercise 3: Non-operative Management

Young adult with uncomplicated appendicitis, patient preference for non-surgical management. Oral antibiotic?

Exercise 4: Pediatric Dosing

30kg child needs piperacillin-tazobactam for complicated appendicitis. Calculate dose.

Exercise 5: Penicillin Allergy

Patient allergic to penicillin with complicated appendicitis. Alternative regimen?

Exercise 6: Duration Decision

Patient with complicated appendicitis completed 5 days IV therapy, clinically improved. Continue treatment?

Exercise 7: Step-down Therapy

Patient improving on IV piperacillin-tazobactam after 5 days. Oral options for step-down?

Exercise 8: Abscess Formation

Patient develops intra-abdominal abscess post-appendectomy. Treatment duration?

Exercise 9: Drug Interaction

Patient on warfarin needs metronidazole for anaerobic coverage. Monitoring required?

Exercise 10: Treatment Failure

No improvement after 72 hours of appropriate antibiotics. Next steps?

Exercise 11: Renal Impairment

Patient with CrCl 25 needs ciprofloxacin for appendicitis. Dosing adjustment?

Exercise 12: Prophylaxis Timing

When should prophylactic antibiotics be given for appendectomy?

Clinical Pearl: Appendicitis antibiotics target enteric flora. Uncomplicated cases need brief prophylaxis; complicated cases require gram-negative and anaerobic coverage for 7-14 days total.

Cholangitis/Cholecystitis

Cholangitis is biliary tree infection requiring urgent biliary drainage and IV antibiotics, presenting with Charcot's triad (fever, jaundice, RUQ pain). Cholecystitis is gallbladder inflammation that may be infectious or inflammatory, with antibiotics indicated for complicated cases or high-risk patients. Both conditions require coverage of enteric gram-negatives and anaerobes.

Common Pathogens

- Escherichia coli (most common)
- Klebsiella pneumoniae
- Enterococcus species
- Pseudomonas aeruginosa (previous biliary procedures)
- Bacteroides fragilis (anaerobic)
- Clostridium perfringens

Antibiotic Choices

1. Acute Cholangitis

First-line:

- Piperacillin-tazobactam 4.5g IV Q6H

- Ceftriaxone 2g IV Q24H PLUS metronidazole 500mg IV Q8H

Second-line:

- Meropenem 1g IV Q8H
- Ciprofloxacin 400mg IV Q12H PLUS metronidazole 500mg IV Q8H

2. Acute Cholecystitis

Mild (prophylaxis):

- Cefazolin 2g IV Q8H

Severe/Complicated:

- Ampicillin-sulbactam 3g IV Q6H
- Ceftriaxone 2g IV Q24H PLUS metronidazole 500mg IV Q8H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Piperacillin-tazobactam	4.5g	300mg/kg/day	Q6H
Ceftriaxone	2g	75mg/kg/day	Q24H
Metronidazole	500mg	30mg/kg/day	Q8H
Meropenem	1g	60mg/kg/day	Q8H
Ampicillin-sulbactam	3g	200mg/kg/day	Q6H
Ciprofloxacin	400mg	30mg/kg/day	Q12H

2. Oral Antibiotics (step-down)

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Metronidazole	500mg	30mg/kg/day	TID
Clindamycin	450mg	30mg/kg/day	QID

3. Renal Adjustments

- Piperacillin-tazobactam: Reduce dose if CrCl <40
- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Meropenem: Reduce dose if CrCl <50
- Ceftriaxone: No adjustment unless CrCl <10

Organism Coverage

- Piperacillin-tazobactam: Broad spectrum including Pseudomonas, anaerobes
- Ceftriaxone: Enteric gram-negatives, some gram-positives
- Metronidazole: Excellent anaerobic coverage
- Meropenem: Broad spectrum including ESBL producers
- Ampicillin-sulbactam: Enterococci, gram-negatives, anaerobes

Contraindications

- Beta-lactams: Severe penicillin allergy
- Fluoroquinolones: Tendon rupture history, myasthenia gravis

- Metronidazole: Alcohol use (disulfiram reaction)
- Meropenem: Severe carbapenem allergy

Adverse Effects

- Piperacillin-tazobactam: Allergic reactions, C. diff colitis
- Metronidazole: Metallic taste, peripheral neuropathy
- Ciprofloxacin: Tendon rupture, QT prolongation
- Meropenem: Seizures (high doses), allergic reactions

Drug Interactions

- Metronidazole: Warfarin (↑ INR), alcohol (disulfiram reaction)
- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Piperacillin-tazobactam: Warfarin (↑ INR)
- Meropenem: Valproic acid (↓ levels)

Treatment Duration

- Cholangitis: 7-14 days (drainage dependent)
- Cholecystitis (complicated): 5-7 days
- Post-operative prophylaxis: 24 hours
- IV therapy: 3-5 days until clinical improvement
- Oral step-down: Complete course as outpatient

PRACTICAL EXERCISES

Exercise 1: Charcot's Triad

Patient with fever, jaundice, and RUQ pain. Blood cultures pending. Empiric antibiotic for cholangitis?

Exercise 2: Complicated Cholecystitis

Elderly diabetic with acute cholecystitis, WBC 18,000, not surgical candidate. Antibiotic choice?

Exercise 3: Previous ERCP

Patient with cholangitis and history of biliary stents. Consider which pathogen in antibiotic selection?

Exercise 4: Pediatric Dosing

25kg child with cholangitis needs piperacillin-tazobactam. Calculate dose.

Exercise 5: Penicillin Allergy

Patient allergic to penicillin develops cholangitis. Alternative regimen?

Exercise 6: Step-down Decision

Patient with cholangitis improving after ERCP and 5 days IV antibiotics. Oral options?

Exercise 7: Duration Question

Patient with complicated cholecystitis completed 7 days antibiotics post-cholecystectomy. Continue?

Exercise 8: Treatment Failure

No improvement after 72 hours of appropriate antibiotics and drainage. Next steps?

Exercise 9: Drug Interaction

Patient on warfarin needs metronidazole for anaerobic coverage. Monitoring required?

Exercise 10: Renal Impairment

Patient with CrCl 30 needs ciprofloxacin for cholangitis. Dosing adjustment?

Exercise 11: Mild Cholecystitis

Young healthy patient with uncomplicated cholecystitis scheduled for laparoscopic cholecystectomy. Antibiotic needed?

Exercise 12: Emphysematous Cholecystitis

Diabetic with gas-forming cholecystitis. Special antibiotic considerations?

Clinical Pearl: Cholangitis requires urgent biliary drainage - antibiotics alone are insufficient. Cholecystitis antibiotics are primarily for complicated cases; uncomplicated cholecystitis needs only perioperative prophylaxis.

Clostridioides Difficile Infections

C. difficile infection (CDI) causes antibiotic-associated colitis ranging from mild diarrhea to life-threatening toxic megacolon. Diagnosis requires clinical symptoms plus positive testing (toxin or PCR). Treatment depends on severity, with oral vancomycin preferred for most cases.

Common Pathogens

- Clostridioides difficile (spore-forming anaerobic bacterium)
- Hypervirulent strains (NAP1/BI/027, increased toxin production)

Antibiotic Choices

1. Initial Episode - Non-severe

First-line:

- Vancomycin 125mg PO QID × 10 days

Alternative:

- Fidaxomicin 200mg PO BID × 10 days

2. Initial Episode - Severe

First-line:

- Vancomycin 125mg PO QID × 10 days

3. Fulminant CDI

First-line:

- Vancomycin 500mg PO QID PLUS metronidazole 500mg IV Q8H

4. First Recurrence

Standard:

- Vancomycin 125mg PO QID × 10 days
- Fidaxomicin 200mg PO BID × 10 days (preferred)

5. Multiple Recurrences

- Vancomycin tapered/pulsed regimen
- Fidaxomicin 200mg PO BID × 10 days
- Fecal microbiota transplantation

Standard Dosing

1. IV Antibiotics (fulminant only)

Drug	Adult Dose	Pediatric Dose	Frequency
Metronidazole	500mg	30mg/kg/day	Q8H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	125-500mg	40mg/kg/day	QID
Fidaxomicin	200mg	Not established	BID
Metronidazole	500mg	30mg/kg/day	TID

3. Renal Adjustments

- Oral vancomycin: No adjustment needed (minimal absorption)
- Metronidazole: Reduce dose in severe hepatic impairment
- Fidaxomicin: No adjustment needed

Organism Coverage

- Oral vancomycin: C. difficile (local gut action)
- Fidaxomicin: C. difficile (narrow spectrum, spares normal flora)
- Metronidazole: C. difficile and other anaerobes

Contraindications

- Oral vancomycin: None significant
- Metronidazole: Alcohol use (disulfiram reaction)
- Fidaxomicin: Hypersensitivity

Adverse Effects

- Oral vancomycin: Minimal (poor absorption)
- Metronidazole: Metallic taste, neuropathy, nausea
- Fidaxomicin: GI upset, rash

Drug Interactions

- Oral vancomycin: Minimal interactions
- Metronidazole: Warfarin (↑ INR), alcohol
- Fidaxomicin: Minimal interactions

Treatment Duration

- Initial episode: 10 days
- Severe/fulminant: 10-14 days
- First recurrence: 10 days
- Tapered regimen: 6-7 weeks total
- Pulsed regimen: 5-7 weeks total

PRACTICAL EXERCISES

Exercise 1: Initial Episode

Patient with mild CDI, no severe symptoms. WBC 12,000, creatinine normal. First-line treatment?

Exercise 2: Severe CDI

Patient with CDI, WBC 18,000, creatinine 1.8. Severe disease criteria met. Treatment?

Exercise 3: Fulminant CDI

Patient with toxic megacolon, ileus, hypotension. Treatment approach?

Exercise 4: First Recurrence

Patient completed vancomycin, symptoms returned 2 weeks later. Stool positive for C. diff. Treatment?

Exercise 5: Pediatric Dosing

20kg child with CDI needs oral vancomycin. Calculate dose.

Exercise 6: Multiple Recurrences

Patient with third CDI recurrence despite standard therapy. Options?

Exercise 7: Duration Question

Patient completed 10 days vancomycin, symptoms resolved. Continue treatment?

Exercise 8: Drug Interaction

Patient on warfarin develops CDI requiring metronidazole. Monitoring needed?

Exercise 9: Treatment Failure

No improvement after 5 days of vancomycin. Next steps?

Exercise 10: Pregnancy

Pregnant woman develops mild CDI. Safest treatment?

Exercise 11: Ileus Complication

Patient with CDI develops ileus, cannot take oral medications. Management?

Exercise 12: Prevention

Patient asks about preventing CDI recurrence. Key recommendations?

Clinical Pearl: Oral vancomycin stays in the gut with minimal absorption - it's the preferred treatment for most CDI. Reserve metronidazole for fulminant cases when combined with vancomycin.

Diverticulitis

Diverticulitis is inflammation of colonic diverticula presenting with LLQ pain, fever, and altered bowel habits. Most uncomplicated cases can be managed with oral antibiotics targeting gram-negatives and anaerobes. Complicated cases with abscess, perforation, or obstruction require IV therapy and often surgical intervention.

Common Pathogens

- Escherichia coli (most common)
- Bacteroides fragilis (anaerobic)
- Enterococcus species
- Klebsiella pneumoniae
- Streptococcus species

Antibiotic Choices

1. Uncomplicated (Outpatient)

First-line:

- Amoxicillin-clavulanate 875/125mg PO BID
- Ciprofloxacin 750mg PO BID PLUS metronidazole 500mg PO TID

Second-line:

- Clindamycin 450mg PO QID PLUS ciprofloxacin 500mg PO BID

2. Complicated (Inpatient)

First-line:

- Piperacillin-tazobactam 4.5g IV Q6H
- Ceftriaxone 2g IV Q24H PLUS metronidazole 500mg IV Q8H

Second-line:

- Meropenem 1g IV Q8H
- Ciprofloxacin 400mg IV Q12H PLUS metronidazole 500mg IV Q8H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Piperacillin-tazobactam	4.5g	300mg/kg/day	Q6H
Ceftriaxone	2g	75mg/kg/day	Q24H
Metronidazole	500mg	30mg/kg/day	Q8H
Meropenem	1g	60mg/kg/day	Q8H
Ciprofloxacin	400mg	30mg/kg/day	Q12H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID

Ciprofloxacin	500-750mg	30mg/kg/day	Q12H
Metronidazole	500mg	30mg/kg/day	TID
Clindamycin	450mg	30mg/kg/day	QID

3. Renal Adjustments

- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Amoxicillin-clavulanate: Reduce dose if CrCl <30
- Piperacillin-tazobactam: Reduce dose if CrCl <40
- Metronidazole: No adjustment needed

Organism Coverage

- Amoxicillin-clavulanate: E. coli, anaerobes, enterococci
- Ciprofloxacin: Gram-negatives (E. coli, Klebsiella)
- Metronidazole: Excellent anaerobic coverage
- Piperacillin-tazobactam: Broad spectrum including Pseudomonas
- Clindamycin: Anaerobes, gram-positives

Contraindications

- Fluoroquinolones: Tendon rupture history, myasthenia gravis
- Amoxicillin-clavulanate: Severe penicillin allergy
- Metronidazole: Alcohol use (disulfiram reaction)
- Beta-lactams: Severe penicillin allergy

Adverse Effects

- Amoxicillin-clavulanate: GI upset, allergic reactions
- Ciprofloxacin: Tendon rupture, QT prolongation
- Metronidazole: Metallic taste, peripheral neuropathy

- Piperacillin-tazobactam: Allergic reactions, C. diff colitis

Drug Interactions

- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Metronidazole: Warfarin (↑ INR), alcohol (disulfiram reaction)
- Amoxicillin-clavulanate: Warfarin (mild ↑ INR)
- Piperacillin-tazobactam: Warfarin (↑ INR)

Treatment Duration

- Uncomplicated: 7-10 days oral
- Complicated: 7-14 days (IV then oral)
- Abscess: 14-21 days total
- IV therapy: 3-5 days until improvement, then oral
- Mild cases: Consider no antibiotics with symptom management

PRACTICAL EXERCISES

Exercise 1: Uncomplicated Case

65-year-old with LLQ pain, low-grade fever, CT shows uncomplicated diverticulitis. Outpatient antibiotic?

Exercise 2: Complicated Case

Patient with diverticulitis and 4cm pelvic abscess. Treatment approach?

Exercise 3: Penicillin Allergy

Patient allergic to penicillin with uncomplicated diverticulitis. Alternative oral regimen?

Exercise 4: Duration Decision

Patient with uncomplicated diverticulitis completed 7 days antibiotics. Symptoms resolved. Continue?

Exercise 5: Step-down Therapy

Patient improving on IV piperacillin-tazobactam after 4 days. Oral options?

Exercise 6: Drug Interaction

Patient on warfarin needs metronidazole for diverticulitis. Monitoring required?

Exercise 7: Treatment Failure

No improvement after 72 hours of appropriate oral antibiotics. Next step?

Exercise 8: Renal Impairment

Patient with CrCl 25 needs ciprofloxacin for diverticulitis. Dosing adjustment?

Exercise 9: Recurrent Episodes

Patient with third episode of diverticulitis in 2 years. Treatment approach?

Exercise 10: Mild Disease

Patient with mild diverticulitis, minimal symptoms, afebrile. Antibiotics needed?

Exercise 11: Perforation

Patient with diverticulitis develops free perforation and peritonitis. Antibiotic choice?

Exercise 12: Abscess Drainage

Patient had percutaneous drainage of diverticular abscess. Antibiotic duration?

Clinical Pearl: Recent studies suggest mild, uncomplicated diverticulitis may not require antibiotics. Reserve antibiotics for complicated cases, immunocompromised patients, or those with systemic symptoms.

Infectious Diarrhea

Infectious diarrhea is usually self-limiting and requires supportive care rather than antibiotics. Antibiotics are indicated for severe illness, immunocompromised hosts, or specific pathogens like Shigella. Most cases resolve with fluid replacement and symptom management.

Common Pathogens

- Campylobacter jejuni (most common bacterial)
- Salmonella species (non-typhoidal)
- Shigella species
- Enterotoxigenic E. coli (traveler's diarrhea)
- Clostridioides difficile (antibiotic-associated)
- Viral pathogens (majority - norovirus, rotavirus)

Antibiotic Choices

1. Empiric Therapy (Severe Cases)

First-line:

- Ciprofloxacin 750mg PO BID
- Azithromycin 500mg PO daily

Second-line:

- Levofloxacin 750mg PO daily

2. Specific Pathogens

Shigella:

- Ciprofloxacin 750mg PO BID × 3 days
- Azithromycin 500mg PO daily × 3 days

Campylobacter:

- Azithromycin 500mg PO daily × 3 days

3. Traveler's Diarrhea:

- Ciprofloxacin 750mg PO BID × 1-3 days
- Azithromycin 1000mg PO single dose

Standard Dosing

1. IV Antibiotics (severe/hospitalized)

Drug	Adult Dose	Pediatric Dose	Frequency
Ciprofloxacin	400mg	30mg/kg/day	Q12H
Azithromycin	500mg	10mg/kg	Daily
Ceftriaxone	2g	75mg/kg/day	Q24H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Ciprofloxacin	500-750mg	30mg/kg/day	Q12H

Azithromycin	500mg	10mg/kg	Daily
Levofloxacin	750mg	16-20mg/kg/day	Daily
Trimethoprim-sulfamethoxazole	DS 1 tablet	8-12mg/kg/day (TMP)	BID

3. Renal Adjustments

- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Levofloxacin: Reduce dose if CrCl <50
- Azithromycin: No adjustment needed
- TMP-SMX: Avoid if CrCl <15

Organism Coverage

- Ciprofloxacin: Campylobacter, Shigella, Salmonella, ETEC
- Azithromycin: Campylobacter, Shigella, Salmonella
- Levofloxacin: Similar to ciprofloxacin
- TMP-SMX: Shigella, some Salmonella (resistance common)

Contraindications

- Fluoroquinolones: Tendon rupture history, myasthenia gravis
- Azithromycin: QT prolongation
- TMP-SMX: Severe renal failure, sulfa allergy

Adverse Effects

- Ciprofloxacin: Tendon rupture, QT prolongation

- Azithromycin: QT prolongation, GI upset
- Levofloxacin: Tendon rupture, QT prolongation
- TMP-SMX: Hyperkalemia, skin reactions

Drug Interactions

- Fluoroquinolones: Warfarin (↑ INR), antacids (↓ absorption)
- Azithromycin: QT-prolonging drugs
- TMP-SMX: Warfarin (↑ INR), methotrexate

Treatment Duration

- Empiric therapy: 3-5 days
- Shigella: 3 days
- Campylobacter: 3-5 days (if treated)
- Traveler's diarrhea: 1-3 days
- Most cases: No antibiotics needed
- Supportive care: Until resolution

PRACTICAL EXERCISES

Exercise 1: Mild Diarrhea

Healthy adult with 2 days of watery diarrhea, no fever, no blood. Treatment approach?

Exercise 2: Severe Presentation

Patient with bloody diarrhea, fever 102°F, severe cramping. Empiric antibiotic?

Exercise 3: Traveler's Diarrhea

Tourist returning from Mexico with acute watery diarrhea. Treatment?

Exercise 4: Shigella Confirmed

Stool culture grows Shigella sonnei. Targeted therapy?

Exercise 5: Pediatric Case

8-year-old with bloody diarrhea, stool culture pending. Weight 25kg. Empiric therapy?

Exercise 6: Duration Question

Patient completed 3 days ciprofloxacin for infectious diarrhea. Symptoms resolved. Continue?

Exercise 7: Salmonella Gastroenteritis

Healthy adult with Salmonella gastroenteritis, mild symptoms. Antibiotic needed?

Exercise 8: Immunocompromised

HIV patient with CD4 50 develops infectious diarrhea. Treatment approach?

Exercise 9: Campylobacter Treatment

Culture confirms Campylobacter jejuni. Patient symptomatic for 5 days. Treat?

Exercise 10: Drug Interaction

Patient on warfarin develops traveler's diarrhea. You prescribe ciprofloxacin. Monitoring?

Exercise 11: Antibiotic-Associated

Patient develops diarrhea during amoxicillin course. Most likely cause and management?

Exercise 12: Prevention

Patient traveling to high-risk area asks about diarrhea prevention. Recommendations?

Clinical Pearl: Most infectious diarrhea is viral and self-limiting. Reserve antibiotics for severe illness, bloody diarrhea, immunocompromised hosts, or specific pathogens like Shigella that require treatment.

Peritoneal Dialysis-Related Peritonitis

PD-related peritonitis is infection of the peritoneal cavity in dialysis patients, presenting with cloudy dialysate, abdominal pain, and fever. Intraperitoneal antibiotics are preferred for treatment, providing high local concentrations with minimal systemic toxicity. Early recognition and appropriate therapy prevent catheter loss and preserve peritoneal membrane function.

Common Pathogens

- Staphylococcus epidermidis (most common gram-positive)
- Staphylococcus aureus (including MRSA)
- Streptococcus species
- Enterococcus species
- Escherichia coli (most common gram-negative)
- Klebsiella pneumoniae
- Pseudomonas aeruginosa

Antibiotic Choices

1. Empiric Therapy (Intraperitoneal)

First-line:

- Vancomycin 15-30mg/kg IP loading, then 1.5g per 2L exchange

PLUS

- Ceftazidime 1000-1500mg per 2L exchange

Second-line:

- Vancomycin PLUS gentamicin 0.6mg/kg IP loading, then 8mg/L

2. Targeted Therapy

MSSA:

- Cefazolin 15mg/kg IP loading, then 500mg per 2L exchange

MRSA:

- Vancomycin 15-30mg/kg IP loading, then 1.5g per 2L exchange

Gram-negative:

- Ceftazidime 1000-1500mg per 2L exchange

Standard Dosing

1. IV Antibiotics (severe cases)

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	15mg/kg	Q12H

Ceftazidime	2g	150mg/kg/day	Q8H
Piperacillin-tazobactam	4.5g	300mg/kg/day	Q6H

2. Oral Antibiotics (step-down)

Drug	Adult Dose	Pediatric Dose	Frequency
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Linezolid	600mg	30mg/kg/day	Q12H
Clindamycin	450mg	30mg/kg/day	QID

3. Intraperitoneal Dosing

Drug	Loading Dose	Maintenance (per 2L)	Duration
Vancomycin	15-30mg/kg	1.5g	14-21 days
Ceftazidime	1000-1500mg	250mg	14-21 days
Cefazolin	15mg/kg	500mg	14-21 days
Gentamicin	0.6mg/kg	8mg/L	14-21 days

Organism Coverage

- Vancomycin: MRSA, MSSA, Streptococci, Enterococci
- Ceftazidime: Gram-negatives including Pseudomonas
- Cefazolin: MSSA, Streptococci (no MRSA)
- Gentamicin: Gram-negatives, synergy with vancomycin

Contraindications

- Vancomycin: Severe hypersensitivity
- Gentamicin: Severe hearing loss, vestibular dysfunction
- Ceftazidime: Severe beta-lactam allergy
- Ciprofloxacin: Tendon rupture history

Adverse Effects

- Vancomycin: Ototoxicity (IP levels), allergic reactions
- Gentamicin: Ototoxicity, vestibular toxicity
- Ceftazidime: Allergic reactions, local irritation
- IP antibiotics: Chemical peritonitis, catheter blockage

Drug Interactions

- Vancomycin: Aminoglycosides (↑ ototoxicity)
- Gentamicin: Loop diuretics (↑ ototoxicity)
- Ciprofloxacin: Warfarin (↑ INR)
- IP antibiotics: Heparin precipitation

Treatment Duration

- Gram-positive: 14 days IP therapy
- Gram-negative: 21 days IP therapy
- Enterococcus: 21 days IP therapy
- Pseudomonas: 21 days IP therapy
- Culture-negative: 14 days empiric therapy
- Severe/recurrent: May require catheter removal

PRACTICAL EXERCISES

Exercise 1: Empiric Selection

PD patient with cloudy dialysate, abdominal pain, dialysate WBC 500/µL. Gram stain pending. Initial therapy?

Exercise 2: MRSA Peritonitis

Dialysate culture grows MRSA. Switch to targeted therapy?

Exercise 3: Gram-negative Coverage

E. coli grown from dialysate culture. Targeted IP therapy?

Exercise 4: Dosing Calculation

70kg patient needs vancomycin loading dose for PD peritonitis. Calculate IP dose.

Exercise 5: Duration Decision

Patient with Streptococcus peritonitis completed 14 days IP therapy. Symptoms resolved. Continue?

Exercise 6: Treatment Failure

No improvement after 96 hours of appropriate IP antibiotics. Next steps?

Exercise 7: Pseudomonas Peritonitis

Dialysate grows Pseudomonas aeruginosa. Treatment duration?

Exercise 8: Catheter Removal

When should PD catheter removal be considered in peritonitis?

Exercise 9: Oral Step-down

Patient improving on IP therapy but needs to travel. Oral alternatives?

Exercise 10: Pediatric Dosing

30kg child needs ceftazidime for PD peritonitis. Calculate IP maintenance dose.

Exercise 11: Aminoglycoside Monitoring

Patient receiving IP gentamicin. What monitoring is required?

Exercise 12: Prevention

PD patient asks about preventing peritonitis. Key recommendations?

Clinical Pearl: Intraperitoneal antibiotics are preferred for PD peritonitis, providing high local concentrations. Start empirically with vancomycin plus ceftazidime, then adjust based on culture results and treat for 14-21 days depending on organism.

Spontaneous Bacterial Peritonitis

SBP is infection of ascitic fluid in cirrhotic patients without an obvious source, diagnosed by ascitic fluid PMN count ≥250 cells/μL. It requires immediate IV antibiotics to prevent high mortality. Treatment should begin empirically while awaiting culture results.

Common Pathogens

- Escherichia coli (most common)
- Klebsiella pneumoniae
- Streptococcus pneumoniae
- Enterococcus species
- Streptococcus viridans group

Antibiotic Choices

1. First-line Therapy

Ceftriaxone:

- 2g IV Q24H

Alternative:

- Cefotaxime 2g IV Q8H

2. Second-line/Penicillin Allergy

Ciprofloxacin:

- 400mg IV Q12H

Aztreonam:

- 2g IV Q8H

3. Nosocomial/Healthcare-Associated

Piperacillin-tazobactam:

- 4.5g IV Q6H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Ceftriaxone	2g	75mg/kg/day	Q24H
Cefotaxime	2g	200mg/kg/day	Q8H
Ciprofloxacin	400mg	30mg/kg/day	Q12H

Piperacillin-tazobactam	4.5g	300mg/kg/day	Q6H
Aztreonam	2g	120mg/kg/day	Q8H

2. Oral Antibiotics (step-down/prophylaxis)

Drug	Adult Dose	Pediatric Dose	Frequency
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Trimethoprim-sulfamethoxazole	DS 1 tablet	8-12mg/kg/day (TMP)	Daily
Norfloxacin	400mg	Not recommended	Q12H

3. Renal Adjustments

- Ceftriaxone: No adjustment unless CrCl <10
- Ciprofloxacin: Reduce dose 50% if CrCl <30
- Piperacillin-tazobactam: Reduce dose if CrCl <40
- TMP-SMX: Avoid if CrCl <15

Organism Coverage

- Ceftriaxone: E. coli, Klebsiella, Streptococci, pneumococci
- Ciprofloxacin: Gram-negatives, some gram-positives
- Piperacillin-tazobactam: Broad spectrum including Pseudomonas
- Aztreonam: Gram-negatives only

Contraindications

- Ceftriaxone: Severe penicillin allergy (relative)
- Ciprofloxacin: Tendon rupture history, myasthenia gravis
- TMP-SMX: Severe renal failure, sulfa allergy
- Aztreonam: Aztreonam hypersensitivity

Adverse Effects

- Ceftriaxone: Allergic reactions, C. diff colitis
- Ciprofloxacin: Tendon rupture, QT prolongation
- Piperacillin-tazobactam: Allergic reactions, C. diff colitis
- Aztreonam: Local reactions, rare allergic reactions

Drug Interactions

- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- TMP-SMX: Warfarin (↑ INR), methotrexate
- Ceftriaxone: Minimal significant interactions
- Piperacillin-tazobactam: Warfarin (↑ INR)

Treatment Duration

- Treatment course: 5-7 days IV therapy
- Culture-negative: 5 days empiric therapy
- Culture-positive: 7 days targeted therapy
- Secondary prophylaxis: Indefinite (cirrhotic patients)
- Primary prophylaxis: Consider in high-risk patients

PRACTICAL EXERCISES

Exercise 1: Classic Presentation

Cirrhotic patient with ascites develops fever and abdominal pain. Paracentesis shows PMN 400/μL. Empiric therapy?

Exercise 2: Culture Results

E. coli grows from ascitic fluid, sensitive to ceftriaxone. Continue current therapy?

Exercise 3: Penicillin Allergy

Patient allergic to penicillin develops SBP. Alternative to ceftriaxone?

Exercise 4: Duration Decision

Patient with culture-negative SBP completed 5 days ceftriaxone. Symptoms resolved. Continue?

Exercise 5: Healthcare-Associated

Hospitalized cirrhotic develops SBP after 10 days admission. Antibiotic modification?

Exercise 6: Secondary Prophylaxis

Patient recovered from first SBP episode. Long-term management?

Exercise 7: Treatment Failure

No improvement after 48 hours appropriate antibiotics. PMN count still elevated. Next steps?

Exercise 8: Renal Impairment

Patient with CrCl 20 needs ciprofloxacin for SBP. Dosing adjustment?

Exercise 9: Step-down Therapy

Patient improving on IV ceftriaxone after 5 days. Consider oral therapy?

Exercise 10: Primary Prophylaxis

When should primary SBP prophylaxis be considered?

Exercise 11: Albumin Administration

Should albumin be given with antibiotic therapy for SBP?

Exercise 12: Ascitic Fluid Analysis

What ascitic fluid parameters suggest SBP diagnosis?

Clinical Pearl: Start ceftriaxone immediately when SBP suspected (PMN ≥250/μL). Add albumin on days 1 and 3 to prevent renal dysfunction. Begin secondary prophylaxis after recovery to prevent recurrence.

Peritonitis/Perforated Viscus/Intra-Abdominal Abscess

These conditions represent serious intra-abdominal infections requiring immediate surgical intervention and broad-spectrum antibiotics. Empiric therapy must cover enteric gram-negatives, gram-positives, and anaerobes. Source control through surgery or drainage is essential for cure.

Common Pathogens

- Escherichia coli (most common gram-negative)
- Bacteroides fragilis (most common anaerobe)
- Enterococcus species
- Klebsiella pneumoniae
- Pseudomonas aeruginosa (healthcare-associated)
- Clostridium species
- Streptococcus species

Antibiotic Choices

1. Community-Acquired

First-line:

- Piperacillin-tazobactam 4.5g IV Q6H
- Ceftriaxone 2g IV Q24H PLUS metronidazole 500mg IV Q8H

Second-line:

- Meropenem 1g IV Q8H
- Ciprofloxacin 400mg IV Q12H PLUS metronidazole 500mg IV Q8H

2. Healthcare-Associated/High-Risk

First-line:

- Meropenem 1g IV Q8H
- Piperacillin-tazobactam 4.5g IV Q6H PLUS vancomycin 15-20mg/kg IV Q8-12H

3. Post-operative

Empiric:

- Piperacillin-tazobactam 4.5g IV Q6H
- Imipenem-cilastatin 500mg IV Q6H

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Piperacillin-tazobactam	4.5g	300mg/kg/day	Q6H
Meropenem	1g	60mg/kg/day	Q8H
Ceftriaxone	2g	75mg/kg/day	Q24H
Metronidazole	500mg	30mg/kg/day	Q8H
Vancomycin	15-20mg/kg	15mg/kg	Q8-12H
Ciprofloxacin	400mg	30mg/kg/day	Q12H

2. Oral Antibiotics (step-down)

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Ciprofloxacin	750mg	30mg/kg/day	Q12H
Metronidazole	500mg	30mg/kg/day	TID
Clindamycin	450mg	30mg/kg/day	QID

3. Renal Adjustments

- Piperacillin-tazobactam: Reduce dose if CrCl <40
- Meropenem: Reduce dose if CrCl <50
- Vancomycin: Dose based on levels and CrCl

- Ciprofloxacin: Reduce dose 50% if CrCl <30

4. Organism Coverage

- Piperacillin-tazobactam: Broad spectrum including Pseudomonas, anaerobes
- Meropenem: Broad spectrum including ESBL producers, anaerobes
- Ceftriaxone: Gram-negatives, some gram-positives
- Metronidazole: Excellent anaerobic coverage
- Vancomycin: MRSA, MSSA, Enterococci

Contraindications

- Beta-lactams: Severe penicillin allergy
- Carbapenems: Severe carbapenem allergy
- Metronidazole: Alcohol use (disulfiram reaction)
- Vancomycin: Red man syndrome history (relative)

Adverse Effects

- Piperacillin-tazobactam: Allergic reactions, C. diff colitis
- Meropenem: Seizures (high doses), allergic reactions
- Metronidazole: Metallic taste, peripheral neuropathy
- Vancomycin: Nephrotoxicity, ototoxicity

Drug Interactions

- Metronidazole: Warfarin (↑ INR), alcohol (disulfiram reaction)
- Ciprofloxacin: Warfarin (↑ INR), antacids (↓ absorption)
- Meropenem: Valproic acid (↓ levels)

- Vancomycin: Aminoglycosides (↑ nephrotoxicity)

Treatment Duration

- Source controlled: 4-7 days post-drainage/surgery
- Adequate drainage: 5-7 days total
- Inadequate drainage: 7-14 days
- Abscess >5cm: 14-21 days
- No source control: Prolonged until surgical intervention

PRACTICAL EXERCISES

Exercise 1: Perforated Appendix

Patient with perforated appendicitis and generalized peritonitis. Post-operative empiric antibiotic?

Exercise 2: Intra-abdominal Abscess

Large pelvic abscess (8cm) in post-operative patient. Treatment approach?

Exercise 3: Healthcare-Associated

ICU patient develops secondary peritonitis after bowel surgery. High-risk empiric therapy?

Exercise 4: Source Control

Patient with adequate surgical drainage and source control. Treatment duration?

Exercise 5: Pediatric Dosing

30kg child needs piperacillin-tazobactam for peritonitis. Calculate dose.

Exercise 6: Step-down Decision

Patient improving on IV antibiotics after drainage, afebrile 48 hours. Oral options?

Exercise 7: Treatment Failure

No improvement after 5 days appropriate antibiotics and drainage. Next steps?

Exercise 8: Drug Interaction

Patient on warfarin needs metronidazole for anaerobic coverage. Monitoring required?

Exercise 9: Enterococcal Growth

Abscess culture grows VRE. Modify antibiotic regimen?

Exercise 10: Renal Impairment

Patient with CrCl 30 needs meropenem. Dosing adjustment?

Exercise 11: Pseudomonas Risk

Previous healthcare exposure, concern for Pseudomonas. Antibiotic choice?

Exercise 12: Fungal Consideration

When should antifungal therapy be added to antibacterial treatment?

Clinical Pearl: Source control is essential - antibiotics alone cannot cure intra-abdominal infections. Adequate drainage or surgical debridement allows shorter antibiotic courses (4-7 days vs weeks without source control).

CHAPTER 9: GENITOURINARY INFECTIONS

Bacterial Vaginosis

Bacterial vaginosis is a polymicrobial condition caused by overgrowth of anaerobic bacteria and reduction in lactobacilli. Presents with malodorous vaginal discharge with "fishy" odor, especially after intercourse. Diagnosis based on Amsel criteria or gram stain showing clue cells.

Common Pathogens

- Gardnerella vaginalis
- Prevotella species
- Bacteroides species
- Mobiluncus species
- Atopobium vaginae
- Mycoplasma hominis

Antibiotic Choices

1. First-line Therapy

Metronidazole:

- 500mg PO BID × 7 days
- 0.75% gel intravaginally daily × 5 days

Clindamycin:

- 300mg PO BID × 7 days
- 2% cream intravaginally at bedtime × 7 days

2. Second-line Therapy

Tinidazole:

- 2g PO daily × 2 days
- 1g PO daily × 5 days

3. Pregnancy

Preferred:

- Metronidazole 500mg PO BID × 7 days
- Clindamycin 300mg PO BID × 7 days

Standard Dosing

1. IV Antibiotics (not typically used)

Drug	Adult Dose	Pediatric Dose	Frequency
Metronidazole	500mg	30mg/kg/day	Q8H
Clindamycin	600mg	40mg/kg/day	Q8H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Metronidazole	500mg	30mg/kg/day	BID
Clindamycin	300mg	20mg/kg/day	BID
Tinidazole	2g daily × 2 days	Not established	Daily

3. Topical Applications

Drug	Adult Dose	Duration	Application
Metronidazole 0.75% gel	5g intravaginally	5 days	Daily
Clindamycin 2% cream	5g intravaginally	7 days	Bedtime

4. Renal Adjustments

- Metronidazole: Reduce dose in severe hepatic impairment
- Clindamycin: No adjustment needed
- Tinidazole: Reduce dose in severe hepatic impairment

Organism Coverage

- Metronidazole: Excellent anaerobic coverage (Gardnerella, Prevotella, Bacteroides)
- Clindamycin: Anaerobes, gram-positives including Gardnerella
- Tinidazole: Similar to metronidazole with better tolerance

Contraindications

- Metronidazole: Alcohol use (disulfiram reaction), first trimester pregnancy (relative)
- Clindamycin: Previous C. diff infection (relative)
- Tinidazole: Alcohol use, pregnancy

Adverse Effects

- Metronidazole: Metallic taste, nausea, disulfiram reaction

- Clindamycin: C. diff colitis (rare with topical), GI upset
- Tinidazole: Similar to metronidazole but better tolerated

Drug Interactions

- Metronidazole: Warfarin (↑ INR), alcohol (disulfiram reaction)
- Clindamycin: Warfarin (↑ INR), minimal with topical use
- Tinidazole: Warfarin (↑ INR), alcohol

Treatment Duration

- Oral metronidazole: 7 days
- Topical metronidazole: 5 days
- Oral clindamycin: 7 days
- Topical clindamycin: 7 days
- Tinidazole: 2-5 days
- Recurrent BV: Consider longer courses or suppressive therapy

PRACTICAL EXERCISES

Exercise 1: Typical Presentation

25-year-old with thin, gray vaginal discharge and fishy odor. Whiff test positive. First-line treatment?

Exercise 2: Pregnancy

Pregnant woman at 20 weeks with bacterial vaginosis. Safest treatment option?

Exercise 3: Recurrent BV

Patient with third episode of BV in 6 months. Treatment approach?

Exercise 4: Alcohol History

Patient with BV reports daily alcohol consumption. Which medication to avoid?

Exercise 5: Topical Preference

Patient prefers topical therapy to avoid systemic side effects. Options?

Exercise 6: Treatment Failure

No improvement after 7 days of metronidazole. Next step?

Exercise 7: Partner Treatment

Patient asks if male partner needs treatment for BV. Recommendation?

Exercise 8: Drug Interaction

Patient on warfarin develops BV. You prescribe metronidazole. Monitoring needed?

Exercise 9: Duration Question

Patient completed 5 days of metronidazole gel. Symptoms resolved. Continue?

Exercise 10: Clindamycin Alternative

Patient cannot tolerate metronidazole. Alternative oral therapy?

Exercise 11: Asymptomatic BV

Routine gynecologic exam shows BV but patient asymptomatic. Treat?

Exercise 12: Prevention

Patient asks about preventing BV recurrence. Recommendations?

Exercise 13: Tinidazole Use

Patient with BV intolerant to both metronidazole and clindamycin. Third-line option?

Exercise 14: Breastfeeding

Breastfeeding mother with BV. Safe treatment choices?

Exercise 15: Adolescent Patient

16-year-old with first episode of BV. Treatment considerations?

Exercise 16: Immunocompromised

HIV-positive patient with recurrent BV. Treatment modifications needed?

Exercise 17: Pre-operative

Patient scheduled for hysterectomy found to have asymptomatic BV. Treatment indicated?

Exercise 18: Gel vs Oral

Patient asks about difference between oral and topical metronidazole. Counseling points?

Exercise 19: Contraceptive Interaction

Patient on oral contraceptives develops BV. Any medication interactions to consider?

Exercise 20: Resistance Pattern

Patient fails multiple standard treatments for BV. Next approach?

Clinical Pearl: Bacterial vaginosis is not sexually transmitted - male partners don't need treatment. Choose metronidazole or clindamycin based on patient factors; both oral and topical forms are equally effective.

Balanitis

Balanitis is inflammation of the glans penis, often infectious but may be inflammatory or allergic. Most cases are fungal (Candida) or bacterial, requiring targeted antimicrobial therapy. Good hygiene and identifying underlying causes are essential for prevention.

Common Pathogens

- Candida albicans (most common)
- Staphylococcus aureus
- Streptococcus pyogenes (Group A Strep)
- Gardnerella vaginalis
- Anaerobic bacteria
- Trichomonas vaginalis

Antibiotic Choices

1. Candidal Balanitis

First-line:

- Fluconazole 150mg PO single dose
- Clotrimazole 1% cream BID × 7-14 days

2. Bacterial Balanitis

First-line:

- Amoxicillin-clavulanate 875/125mg PO BID
- Clindamycin 300mg PO QID

Severe/Hospitalized:

- Ampicillin-sulbactam 3g IV Q6H

3. Trichomonas

Treatment:

- Metronidazole 2g PO single dose
- Tinidazole 2g PO single dose

Standard Dosing

1. IV Antibiotics (severe cases)

Drug	Adult Dose	Pediatric Dose	Frequency
Ampicillin-sulbactam	3g	200mg/kg/day	Q6H
Clindamycin	600mg	40mg/kg/day	Q8H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Clindamycin	300mg	20mg/kg/day	QID
Fluconazole	150mg	6mg/kg	Single dose

Metronidazole	2g single dose	15mg/kg	Single dose
Doxycycline	100mg	4mg/kg/day	BID

3. Renal Adjustments

- Fluconazole: Reduce dose 50% if CrCl <50
- Metronidazole: No adjustment for single dose
- Amoxicillin-clavulanate: Reduce dose if CrCl <30

Organism Coverage

- Fluconazole: Candida species (not C. krusei)
- Clotrimazole: Candida and dermatophytes
- Amoxicillin-clavulanate: Streptococci, staphylococci, anaerobes
- Clindamycin: Gram-positives, anaerobes
- Metronidazole: Trichomonas, anaerobes

Contraindications

- Fluconazole: Severe liver disease, QT prolongation
- Metronidazole: Alcohol use (disulfiram reaction)
- Amoxicillin-clavulanate: Severe penicillin allergy
- Doxycycline: Children <8 years, pregnancy

Adverse Effects

- Fluconazole: Hepatotoxicity, QT prolongation
- Topical antifungals: Local irritation
- Metronidazole: Metallic taste, nausea
- Clindamycin: C. diff colitis, GI upset

Drug Interactions

- Fluconazole: Warfarin (↑ INR), phenytoin
- Metronidazole: Warfarin (↑ INR), alcohol
- Clindamycin: Warfarin (↑ INR)

Treatment Duration

- Candidal: Single dose fluconazole or 7-14 days topical
- Bacterial: 7-10 days oral antibiotics
- Trichomonas: Single dose metronidazole/tinidazole
- Recurrent cases: Extended courses or maintenance therapy
- Treat sexual partners: For Trichomonas and recurrent Candida

PRACTICAL EXERCISES

Exercise 1: Typical Candidal

Male with erythematous, itchy glans with white discharge. KOH shows budding yeast. Treatment?

Exercise 2: Bacterial Balanitis

Uncircumcised male with purulent discharge and tender glans. First-line antibiotic?

Exercise 3: Diabetic Patient

Diabetic male with recurrent candidal balanitis. Treatment approach?

Exercise 4: Trichomonas

Male partner of woman with trichomonas. Asymptomatic but needs treatment. Regimen?

Exercise 5: Pediatric Case

8-year-old boy with balanitis, appears bacterial. Weight 30kg. Antibiotic choice and dose?

Exercise 6: Recurrent Episodes

Third episode of candidal balanitis in 6 months. Management strategy?

Exercise 7: Topical vs Oral

Patient prefers topical therapy for candidal balanitis. Options?

Exercise 8: Treatment Failure

No improvement after 7 days fluconazole for presumed Candida. Next step?

Exercise 9: Drug Interaction

Patient on warfarin develops candidal balanitis. You prescribe fluconazole. Monitoring?

Exercise 10: Severe Presentation

Cellulitis extending from glans with fever and lymphadenopathy. Treatment approach?

Exercise 11: Partner Treatment

When should female partners be treated for male balanitis?

Exercise 12: Contact Dermatitis

Patient with apparent allergic balanitis from new soap. Management?

Exercise 13: Immunocompromised

HIV patient with severe candidal balanitis. Treatment modifications?

Exercise 14: Alcohol History

Patient with trichomonas balanitis drinks alcohol daily. Treatment considerations?

Exercise 15: Circumcision Status

How does circumcision status affect treatment decisions?

Exercise 16: Culture Results

Culture grows Group A Strep from balanitis. Targeted therapy?

Exercise 17: Renal Impairment

Patient with CrCl 25 needs fluconazole. Dosing adjustment?

Exercise 18: Chronic/Recurrent

Patient with chronic balanitis, multiple organism types. Long-term management?

Exercise 19: Adolescent Patient

16-year-old with first episode balanitis. Counseling and treatment considerations?

Exercise 20: Prevention

Patient asks about preventing recurrent balanitis. Key recommendations?

Clinical Pearl: Most balanitis is candidal - try fluconazole first. If no improvement in 7 days, consider bacterial

infection and switch to antibiotics. Always treat partners for trichomonas.

Endometritis

Balanitis is inflammation of the glans penis, often infectious but may be inflammatory or allergic. Most cases are fungal (Candida) or bacterial, requiring targeted antimicrobial therapy. Good hygiene and identifying underlying causes are essential for prevention.

Common Pathogens

- Candida albicans (most common)
- Staphylococcus aureus
- Streptococcus pyogenes (Group A Strep)
- Gardnerella vaginalis
- Anaerobic bacteria
- Trichomonas vaginalis

Antibiotic Choices

1. Candidal Balanitis

First-line:

- Fluconazole 150mg PO single dose
- Clotrimazole 1% cream BID × 7-14 days

2. Bacterial Balanitis

First-line:

- Amoxicillin-clavulanate 875/125mg PO BID
- Clindamycin 300mg PO QID

Severe/Hospitalized:

- Ampicillin-sulbactam 3g IV Q6H

3. Trichomonas

Treatment:

- Metronidazole 2g PO single dose
- Tinidazole 2g PO single dose

Standard Dosing

1. IV Antibiotics (severe cases)

Drug	Adult Dose	Pediatric Dose	Frequency
Ampicillin-sulbactam	3g	200mg/kg/day	Q6H
Clindamycin	600mg	40mg/kg/day	Q8H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin-clavulanate	875/125mg	90mg/kg/day	BID
Clindamycin	300mg	20mg/kg/day	QID
Fluconazole	150mg	6mg/kg	Single dose
Metronidazole	2g single dose	15mg/kg	Single dose
Doxycycline	100mg	4mg/kg/day	BID

3. Renal Adjustments

- Fluconazole: Reduce dose 50% if CrCl <50
- Metronidazole: No adjustment for single dose
- Amoxicillin-clavulanate: Reduce dose if CrCl <30

Organism Coverage

- Fluconazole: Candida species (not C. krusei)
- Clotrimazole: Candida and dermatophytes
- Amoxicillin-clavulanate: Streptococci, staphylococci, anaerobes
- Clindamycin: Gram-positives, anaerobes
- Metronidazole: Trichomonas, anaerobes

Contraindications

- Fluconazole: Severe liver disease, QT prolongation
- Metronidazole: Alcohol use (disulfiram reaction)
- Amoxicillin-clavulanate: Severe penicillin allergy
- Doxycycline: Children <8 years, pregnancy

Adverse Effects

- Fluconazole: Hepatotoxicity, QT prolongation
- Topical antifungals: Local irritation
- Metronidazole: Metallic taste, nausea
- Clindamycin: C. diff colitis, GI upset

Drug Interactions

- Fluconazole: Warfarin (↑ INR), phenytoin
- Metronidazole: Warfarin (↑ INR), alcohol
- Clindamycin: Warfarin (↑ INR)

Treatment Duration

- Candidal: Single dose fluconazole or 7-14 days topical
- Bacterial: 7-10 days oral antibiotics
- Trichomonas: Single dose metronidazole/tinidazole
- Recurrent cases: Extended courses or maintenance therapy
- Treat sexual partners: For Trichomonas and recurrent Candida

PRACTICAL EXERCISES

Exercise 1: Typical Candidal

Male with erythematous, itchy glans with white discharge. KOH shows budding yeast. Treatment?

Exercise 2: Bacterial Balanitis

Uncircumcised male with purulent discharge and tender glans. First-line antibiotic?

Exercise 3: Diabetic Patient

Diabetic male with recurrent candidal balanitis. Treatment approach?

Exercise 4: Trichomonas

Male partner of woman with trichomonas. Asymptomatic but needs treatment. Regimen?

Exercise 5: Pediatric Case

8-year-old boy with balanitis, appears bacterial. Weight 30kg. Antibiotic choice and dose?

Exercise 6: Recurrent Episodes

Third episode of candidal balanitis in 6 months. Management strategy?

Exercise 7: Topical vs Oral

Patient prefers topical therapy for candidal balanitis. Options?

Exercise 8: Treatment Failure

No improvement after 7 days fluconazole for presumed Candida. Next step?

Exercise 9: Drug Interaction

Patient on warfarin develops candidal balanitis. You prescribe fluconazole. Monitoring?

Exercise 10: Severe Presentation

Cellulitis extending from glans with fever and lymphadenopathy. Treatment approach?

Exercise 11: Partner Treatment

When should female partners be treated for male balanitis?

Exercise 12: Contact Dermatitis

Patient with apparent allergic balanitis from new soap. Management?

Exercise 13: Immunocompromised

HIV patient with severe candidal balanitis. Treatment modifications?

Exercise 14: Alcohol History

Patient with trichomonas balanitis drinks alcohol daily. Treatment considerations?

Exercise 15: Circumcision Status

How does circumcision status affect treatment decisions?

Exercise 16: Culture Results

Culture grows Group A Strep from balanitis. Targeted therapy?

Exercise 17: Renal Impairment

Patient with CrCl 25 needs fluconazole. Dosing adjustment?

Exercise 18: Chronic/Recurrent

Patient with chronic balanitis, multiple organism types. Long-term management?

Exercise 19: Adolescent Patient

16-year-old with first episode balanitis. Counseling and treatment considerations?

Exercise 20: Prevention

Patient asks about preventing recurrent balanitis. Key recommendations?

Exercise 13: Immunocompromised

HIV patient with severe candidal balanitis. Treatment modifications?

Exercise 14: Alcohol History

Patient with trichomonas balanitis drinks alcohol daily. Treatment considerations?

Exercise 15: Circumcision Status

How does circumcision status affect treatment decisions?

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Exercise 18: Chronic/Recurrent

Patient with chronic balanitis, multiple organism types. Long-term management?

Exercise 19: Adolescent Patient

16-year-old with first episode balanitis. Counseling and treatment considerations?

Exercise 20: Prevention

Patient asks about preventing recurrent balanitis. Key recommendations?

Clinical Pearl: Most balanitis is candidal - try fluconazole first. If no improvement in 7 days, consider bacterial infection and switch to antibiotics. Always treat partners for trichomonas.

Epididymitis/Orchitis

Epididymitis is inflammation of the epididymis causing scrotal pain, swelling, and tenderness. In sexually active men <35, it's usually chlamydial or gonococcal; in older men, it's typically from enteric bacteria. Orchitis often accompanies severe epididymitis or occurs with viral infections like mumps.

Common Pathogens

- Chlamydia trachomatis (young, sexually active)
- Neisseria gonorrhoeae (young, sexually active)
- Escherichia coli (older men, urinary tract source)
- Enterococcus species (older men)
- Pseudomonas aeruginosa (post-instrumentation)
- Mumps virus (orchitis)

Antibiotic Choices

1. Age <35 (Sexually Active)

First-line:

- Ceftriaxone 250mg IM single dose PLUS doxycycline 100mg PO BID × 10 days

Alternative:

- Azithromycin 1g PO weekly × 2 weeks PLUS ceftriaxone 250mg IM

2. Age >35 (Enteric Bacteria)

First-line:

- Ciprofloxacin 500mg PO BID × 10 days
- Trimethoprim-sulfamethoxazole DS PO BID × 10 days

3. Severe/Hospitalized

First-line:

- Ceftriaxone 1g IV Q24H PLUS doxycycline 100mg PO BID

Standard Dosing

1. IV Antibiotics (severe cases)

Drug	Adult Dose	Pediatric Dose	Frequency
Ceftriaxone	1g	50mg/kg/day	Q24H
Ciprofloxacin	400mg	30mg/kg/day	Q12H
Ampicillin-sulbactam	3g	200mg/kg/day	Q6H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Doxycycline	100mg	4mg/kg/day	BID
Ciprofloxacin	500mg	30mg/kg/day	BID
Azithromycin	1g weekly	20mg/kg weekly	Weekly
TMP-SMX	DS 1 tablet	8-12mg/kg/day (TMP)	BID
Cephalexin	500mg	50mg/kg/day	QID

3. Renal Adjustments

- Ciprofloxacin: Reduce dose 50% if CrCl <30
- TMP-SMX: Avoid if CrCl <15
- Doxycycline: No adjustment needed

Organism Coverage

- Doxycycline: Chlamydia, some gonococci, gram-positives
- Ceftriaxone: Gonococci, gram-negatives, some gram-positives
- Ciprofloxacin: Gram-negatives, some gram-positives
- Azithromycin: Chlamydia, some gonococci
- TMP-SMX: Gram-negatives, some gram-positives

Contraindications

- Doxycycline: Pregnancy, children <8 years
- Ciprofloxacin: Tendon rupture history, myasthenia gravis
- TMP-SMX: Severe renal failure, sulfa allergy
- Ceftriaxone: Severe penicillin allergy (relative)

Adverse Effects

- Doxycycline: Photosensitivity, esophagitis
- Ciprofloxacin: Tendon rupture, QT prolongation
- TMP-SMX: Hyperkalemia, skin reactions
- Ceftriaxone: Allergic reactions, injection site pain

Drug Interactions

- Doxycycline: Antacids (↓ absorption), warfarin

- Ciprofloxacin: Warfarin (↑ INR), antacids
- TMP-SMX: Warfarin (↑ INR), methotrexate

Treatment Duration

- STI-related (age <35): 10 days
- Enteric bacteria (age >35): 10-14 days
- Severe cases: 14 days
- Chronic epididymitis: 4-6 weeks
- Partner treatment: For STI cases

PRACTICAL EXERCISES

Exercise 1: Young Sexually Active

22-year-old sexually active male with acute epididymitis. First-line treatment?

Exercise 2: Older Patient

55-year-old with epididymitis, no recent sexual activity. Antibiotic choice?

Exercise 3: Severe Presentation

Patient with epididymitis, fever 102°F, unable to walk. Treatment approach?

Exercise 4: Partner Treatment

25-year-old with chlamydial epididymitis. Should partner be treated?

Exercise 5: Duration Question

Patient completed 10 days doxycycline for epididymitis. Symptoms resolved. Continue?

Exercise 6: Treatment Failure

No improvement after 5 days appropriate antibiotics. Next steps?

Exercise 7: Mumps Orchitis

Adult male with mumps develops orchitis. Antibiotic therapy indicated?

Exercise 8: Pediatric Case

12-year-old boy with epididymitis. Likely cause and treatment?

Exercise 9: Fluoroquinolone Allergy

Patient allergic to ciprofloxacin needs treatment for enteric epididymitis. Alternative?

Exercise 10: Chronic Epididymitis

Patient with chronic epididymitis for 3 months. Treatment approach?

Exercise 11: Post-instrumentation

Epididymitis following prostate biopsy. Pathogen consideration?

Exercise 12: Drug Interaction

Patient on warfarin develops epididymitis. You prescribe ciprofloxacin. Monitoring?

Exercise 13: Pregnancy Partner

Male with chlamydial epididymitis, pregnant partner. Treatment considerations?

Exercise 14: Renal Impairment

Patient with CrCl 20 needs ciprofloxacin. Dosing adjustment?

Exercise 15: Bilateral Involvement

Patient with bilateral epididymo-orchitis. Treatment modifications?

Exercise 16: MSM Population

Men who have sex with men with epididymitis. Additional considerations?

Exercise 17: Catheter-Associated

Patient with indwelling catheter develops epididymitis. Likely organisms?

Exercise 18: Azithromycin Dosing

Patient needs azithromycin for chlamydial epididymitis. Calculate 2-week course.

Exercise 19: Abscess Formation

Epididymitis with abscess on ultrasound. Management approach?

Exercise 20: Prevention

Patient asks about preventing recurrent epididymitis. Key recommendations?

Clinical Pearl: Age determines treatment: <35 years treat for STIs (ceftriaxone + doxycycline), >35 years treat for enteric bacteria (ciprofloxacin). Always treat partners in STI cases.

Herpes Simplex Virus

HSV infections present as painful vesicular lesions that ulcerate, affecting genital or oral areas. Treatment with antivirals reduces symptoms, viral shedding, and transmission risk. Early treatment within 72 hours of symptom onset provides maximum benefit.

Common Pathogens

- Herpes simplex virus type 1 (HSV-1) (oral and genital)
- Herpes simplex virus type 2 (HSV-2) (primarily genital)

Antibiotic Choices

1. First Episode Genital HSV

First-line:

- Acyclovir 400mg PO TID × 7-10 days
- Valacyclovir 1g PO BID × 7-10 days

2. Recurrent Episodes

First-line:

- Acyclovir 800mg PO TID × 2 days
- Valacyclovir 500mg PO BID × 3 days

3. Suppressive Therapy

Daily suppression:

- Acyclovir 400mg PO BID
- Valacyclovir 500mg PO daily

4. Severe/Hospitalized

IV therapy:

- Acyclovir 5-10mg/kg IV Q8H

Standard Dosing

1. IV Antivirals

Drug	Adult Dose	Pediatric Dose	Frequency
Acyclovir	5-10mg/kg	10-15mg/kg	Q8H
Foscarnet	40mg/kg	40mg/kg	Q8H

2. Oral Antivirals

Drug	Adult Dose	Pediatric Dose	Frequency
Acyclovir	400-800mg	20mg/kg (max 800mg)	TID-5×/day
Valacyclovir |	500mg-1g	20mg/kg (max 1g)	BID-TID
Famciclovir	250-500mg	Not established	BID-TID

3. Renal Adjustments

- Acyclovir: Reduce dose if CrCl <50
- Valacyclovir: Reduce dose if CrCl <50
- Famciclovir: Reduce dose if CrCl <60

Organism Coverage

- Acyclovir: HSV-1, HSV-2, VZV
- Valacyclovir: HSV-1, HSV-2, VZV (prodrug of acyclovir)
- Famciclovir: HSV-1, HSV-2, VZV (prodrug of penciclovir)

Contraindications

- Acyclovir: Hypersensitivity
- Valacyclovir: Hypersensitivity to acyclovir/valacyclovir
- Famciclovir: Hypersensitivity

Adverse Effects

- Acyclovir: Nephrotoxicity (IV), GI upset, headache
- Valacyclovir: GI upset, headache, dizziness
- Famciclovir: Headache, nausea, fatigue

Drug Interactions

- Acyclovir: Probenecid (↑ levels), nephrotoxic drugs
- Valacyclovir: Minimal interactions
- Famciclovir: Minimal interactions

Treatment Duration

- First episode: 7-10 days
- Recurrent episodes: 1-5 days
- Suppressive therapy: 6-12 months, reassess
- Severe/disseminated: 7-14 days IV
- Start within 72 hours for maximum efficacy

PRACTICAL EXERCISES

Exercise 1: First Episode

25-year-old with first episode of painful genital ulcers, confirmed HSV-2. Treatment?

Exercise 2: Recurrent Episode

Patient with known HSV having typical recurrence. Early treatment option?

Exercise 3: Suppressive Therapy

Patient with 6+ HSV recurrences per year. Suppression regimen?

Exercise 4: Severe Disease

Immunocompromised patient with disseminated HSV. Treatment approach?

Exercise 5: Pediatric Dosing

30kg child with HSV gingivostomatitis needs acyclovir. Calculate dose.

Exercise 6: Pregnancy

Pregnant woman with first episode HSV at 36 weeks. Treatment?

Exercise 7: Renal Impairment

Patient with CrCl 30 needs valacyclovir. Dosing adjustment?

Exercise 8: Late Presentation

Patient presents 5 days after lesion onset. Still treat?

Exercise 9: Suppression Duration

Patient on suppressive therapy for 12 months. Continue indefinitely?

Exercise 10: HSV Encephalitis

Suspected HSV encephalitis in ICU patient. Immediate treatment?

Exercise 11: Partner Treatment

Patient with HSV asks if partner needs treatment. Recommendation?

Exercise 12: Oral HSV

Patient with recurrent cold sores. Treatment options?

Exercise 13: Acyclovir Resistance

HIV patient with acyclovir-resistant HSV. Alternative therapy?

Exercise 14: Transmission Reduction

Discordant couple, HSV-positive partner. Risk reduction strategies?

Exercise 15: Episodic vs Suppressive

Patient with 4 recurrences yearly. Episodic or suppressive therapy?

Exercise 16: IV to Oral Transition

Patient improving on IV acyclovir after 5 days. Switch to oral?

Exercise 17: Prodromal Symptoms

Patient recognizes prodromal symptoms before lesions. When to start treatment?

Exercise 18: Valacyclovir vs Acyclovir

Patient asks difference between valacyclovir and acyclovir. Explanation?

Exercise 19: Immunocompromised Dosing

HIV patient with CD4 100 has recurrent HSV. Dose modification needed?

Exercise 20: Cost Considerations

Uninsured patient needs HSV treatment. Most cost-effective option?

Clinical Pearl: Start treatment within 72 hours of symptom onset for maximum benefit. First episodes need 7-10 days; recurrences only need 1-5 days. Suppressive therapy reduces transmission by ~50%.

CHAPTER 10: PULMONARY INFECTIONS

Bronchitis

Acute bronchitis is a self-limiting inflammatory condition of the bronchi, typically viral in etiology (90-95% of cases). Bacterial superinfection may occur in patients with underlying COPD, immunocompromise, or prolonged symptoms beyond 10-14 days. Antibiotic therapy is generally not indicated for uncomplicated acute bronchitis in healthy adults.

Common Pathogens

- Viral (90-95%): Rhinovirus, influenza A/B, parainfluenza, RSV, adenovirus
- Bacterial (5-10%): Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis
- Atypical: Mycoplasma pneumoniae, Chlamydophila pneumoniae, Bordetella pertussis
- COPD exacerbation: H. influenzae, S. pneumoniae, M. catarrhalis, Pseudomonas aeruginosa

Antibiotic Choices

1. Uncomplicated Acute Bronchitis

First-line:

- No antibiotics recommended (supportive care)

2. COPD Exacerbation

First-line:

- Azithromycin 500mg PO day 1, then 250mg daily × 4 days
- Doxycycline 100mg PO BID × 5-7 days

3. Suspected Atypical Pathogens

First-line:

- Azithromycin 500mg PO day 1, then 250mg daily × 4 days
- Clarithromycin 500mg PO BID × 7 days

4. Treatment Failure/Severe COPD

Second-line:

- Levofloxacin 750mg PO daily × 5 days
- Amoxicillin-clavulanate 875/125mg PO BID × 5-7 days

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Azithromycin	500mg	10mg/kg	Daily
Levofloxacin	750mg	Not recommended <18yr	Daily
Cefuroxime	1.5g	150mg/kg/day divided	TID
Amoxicillin-clavulanate	1.2g	100mg/kg/day divided	TID

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Azithromycin	500mg day 1, then 250mg	10mg/kg day 1, then 5mg/kg	Daily
Doxycycline	100mg	Not recommended <8yr	BID
Clarithromycin	500mg	15mg/kg/day divided	BID
Levofloxacin	750mg	Not recommended <18yr	Daily
Amoxicillin-clavulanate	875/125mg	45mg/kg/day divided	BID

3. Renal Adjustments

- Azithromycin: No adjustment needed
- Doxycycline: Use with caution if CrCl <30
- Levofloxacin: CrCl 20-49: 750mg Q48H
- Amoxicillin-clavulanate: CrCl <30: 875/125mg daily

Organism Coverage

- Azithromycin: HSV-1, HSV-2, VZV, atypicals, S. pneumoniae, H. influenzae
- Doxycycline: Atypicals, S. pneumoniae, H. influenzae, M. catarrhalis
- Levofloxacin: Broad spectrum including S. pneumoniae, H. influenzae, atypicals

- Amoxicillin-clavulanate: S. pneumoniae, H. influenzae, M. catarrhalis, beta-lactamase producers

Contraindications

- Azithromycin: Hypersensitivity, severe hepatic impairment
- Doxycycline: Pregnancy, children <8 years, severe hepatic impairment
- Levofloxacin: Hypersensitivity, myasthenia gravis, children <18 years
- Amoxicillin-clavulanate: Penicillin allergy, history of cholestatic jaundice

Adverse Effects

- Azithromycin: QT prolongation, GI upset, hepatotoxicity
- Doxycycline: Photosensitivity, GI upset, esophageal irritation
- Levofloxacin: Tendon rupture, CNS effects, QT prolongation
- Amoxicillin-clavulanate: Diarrhea, C. difficile risk, hepatotoxicity

Drug Interactions

- Azithromycin: Warfarin (↑INR), digoxin (↑levels), QT-prolonging drugs
- Doxycycline: Antacids/iron (↓absorption), warfarin (↑INR)
- Levofloxacin: Antacids/iron (↓absorption), warfarin (↑INR), QT-prolonging drugs

- Amoxicillin-clavulanate: Warfarin (↑INR), allopurinol (↑rash risk)

Treatment Duration

- Uncomplicated bronchitis: No antibiotics (supportive care)
- COPD exacerbation: 5-7 days
- Azithromycin Z-pack: 5 days
- Levofloxacin: 5 days
- Clarithromycin: 7 days
- Start within 24-48 hours of worsening symptoms in COPD

PRACTICAL EXERCISES

Exercise 1: Healthy Adult

45-year-old office worker with 5 days of productive cough, low-grade fever. No lung disease. Treatment?

Exercise 2: COPD Exacerbation

68-year-old with COPD (FEV1 45%) has increased dyspnea, purulent sputum for 4 days. Antibiotic choice?

Exercise 3: Atypical Pathogens

35-year-old teacher with 3-week persistent dry cough after URI. Suspected pathogen and treatment?

Exercise 4: Penicillin Allergy

52-year-old diabetic with bronchitis needs antibiotics. Has penicillin allergy (rash). Treatment?

Exercise 5: Treatment Failure

70-year-old severe COPD on azithromycin × 3 days, not improving. Sputum shows Pseudomonas. Next step?

Exercise 6: Drug Interaction

Patient prescribed doxycycline for bronchitis also takes antacids for GERD. Counseling?

Exercise 7: Pregnancy

28-year-old pregnant woman (20 weeks) with asthma develops purulent bronchitis. Safest antibiotic?

Exercise 8: Renal Impairment

80-year-old with CrCl 25 needs amoxicillin-clavulanate for COPD exacerbation. Dosing?

Exercise 9: Warfarin Interaction

Patient on warfarin (INR 2.5) prescribed azithromycin. Monitoring plan?

Exercise 10: Pertussis

16-year-old with 2-week "whooping" cough, paroxysmal episodes. Treatment?

Exercise 11: Tendon Pain

Patient on levofloxacin develops Achilles tendon pain day 3. Management?

Exercise 12: Antibiotic Request

25-year-old healthy student with acute bronchitis requests antibiotics for upcoming exam. Response?

Exercise 13: Dosing Calculation

75kg patient with severe COPD exacerbation needs IV azithromycin. Calculate appropriate dose.

Exercise 14: Duration Decision

Patient with COPD started on doxycycline for bronchitis. After how many days should improvement be seen?

Exercise 15: Organism Matching

COPD patient's sputum culture shows H. influenzae beta-lactamase positive. Best antibiotic choice?

Exercise 16: Adverse Effect Recognition

Patient on azithromycin develops diarrhea and abdominal cramping on day 4. Management?

Exercise 17: Treatment Failure Scenario

COPD patient completed 5-day azithromycin course but symptoms persist. Next approach?

Exercise 18: Contraindication Recognition

8-year-old child with bronchitis. Parent requests doxycycline "like last time." Response?

Exercise 19: Drug Selection

Elderly patient with QT prolongation on ECG needs treatment for COPD exacerbation. Avoid which antibiotics?

Exercise 20: Cost-Effectiveness

Uninsured patient with COPD exacerbation. Most cost-effective antibiotic option while maintaining efficacy?

Clinical Pearl: The "5-day rule" for bronchitis: When antibiotics are truly indicated (COPD, immunocompromised), choose 5-day courses when possible. Azithromycin Z-pack and levofloxacin 5-day regimens are as effective as longer courses with better compliance.

Influenza

Influenza is an acute viral respiratory illness caused by influenza A or B viruses, presenting with fever, myalgia, headache, and respiratory symptoms. Antiviral treatment is most effective when started within 48 hours of symptom onset, reducing illness duration by 1-2 days. Treatment is recommended for high-risk patients, severe illness, or hospitalized patients regardless of symptom duration.

Common Pathogens

- Influenza A: H1N1, H3N2 (seasonal epidemics and pandemics)
- Influenza B: Victoria and Yamagata lineages
- Influenza C: Mild illness, rare
- Secondary bacterial infections: Streptococcus pneumoniae, Staphylococcus aureus, Haemophilus influenzae

Antibiotic Choices

1. Uncomplicated Influenza

First-line:

- Oseltamivir 75mg PO BID × 5 days
- Zanamivir 10mg inhaled BID × 5 days

2. Severe/Hospitalized Patients

First-line:

- Oseltamivir 75mg PO BID × 5 days (or IV if unable to take PO)
- Peramivir 600mg IV single dose

3. Oseltamivir-Resistant Strains

Alternative:

- Zanamivir 10mg inhaled BID × 5 days
- Peramivir 600mg IV single dose

4. Secondary Bacterial Pneumonia

Antibiotics:

- Amoxicillin-clavulanate 875/125mg PO BID × 7-10 days
- Ceftriaxone 1-2g IV daily + azithromycin 500mg daily

Standard Dosing

1. IV Antivirals

Drug	Adult Dose	Pediatric Dose	Frequency

Peramivir	600mg	12mg/kg (max 600mg)	Single dose
Oseltamivir (IV)	75mg	Age-based dosing	BID

2. Oral Antivirals

Drug	Adult Dose	Pediatric Dose	Frequency
Oseltamivir	75mg	30-75mg based on weight	BID
Zanamivir	10mg (2 inhalations)	10mg if ≥7 years	BID
Baloxavir	40-80mg based on weight	40mg if 40-80kg, 80mg if >80kg	Single dose

3. Renal Adjustments

- Oseltamivir: CrCl 30-60: 30mg BID; CrCl 10-30: 30mg daily
- Peramivir: CrCl 30-49: 200mg; CrCl 10-29: 100mg
- Zanamivir: No adjustment needed (minimal systemic absorption)

Organism Coverage

- Oseltamivir: Influenza A and B, some resistance in H1N1
- Zanamivir: Influenza A and B, less resistance than oseltamivir

- Peramivir: Influenza A and B, IV option for severe cases
- Baloxavir: Influenza A and B, single-dose convenience

Contraindications

- Oseltamivir: Hypersensitivity, end-stage renal disease
- Zanamivir: Underlying respiratory disease (asthma, COPD), hypersensitivity
- Peramivir: Hypersensitivity, severe renal impairment
- Baloxavir: Hypersensitivity, pregnancy (limited data)

Adverse Effects

- Oseltamivir: Nausea, vomiting, neuropsychiatric effects (rare)
- Zanamivir: Bronchospasm, respiratory irritation
- Peramivir: Diarrhea, neutropenia, skin reactions
- Baloxavir: Diarrhea, bronchitis, nasopharyngitis

Drug Interactions

- Oseltamivir: Minimal interactions, renally eliminated
- Zanamivir: Minimal interactions due to inhaled route
- Peramivir: Minimal interactions, renally eliminated
- Baloxavir: Avoid with polyvalent cations (Ca^{2+}, Mg^{2+}, Fe^{3+}, Zn^{2+})

Treatment Duration

- Oseltamivir: 5 days (may extend to 10 days in immunocompromised)
- Zanamivir: 5 days
- Peramivir: Single dose (600mg IV)

- Baloxavir: Single dose
- Start within 48 hours of symptom onset for maximum benefit
- Hospitalized patients: Treat regardless of symptom duration

PRACTICAL EXERCISES

Exercise 1: Early Treatment

48-year-old healthy adult with 24-hour history of fever, myalgia, headache during flu season. Treatment?

Exercise 2: Late Presentation

35-year-old presents 4 days after flu symptom onset. Otherwise healthy. Treat with antivirals?

Exercise 3: High-Risk Patient

72-year-old diabetic with CHF develops flu symptoms 36 hours ago. Treatment approach?

Exercise 4: Hospitalized Patient

65-year-old admitted with severe influenza pneumonia, 5 days of symptoms. Antiviral choice?

Exercise 5: Pediatric Dosing

25kg, 8-year-old child with confirmed influenza. Calculate oseltamivir dose.

Exercise 6: Asthma Contraindication

Adult with severe asthma develops influenza. Oseltamivir unavailable. Alternative antiviral?

Exercise 7: Renal Impairment

Patient with CrCl 35 mL/min needs oseltamivir for influenza. Dosing adjustment?

Exercise 8: Pregnancy

28-year-old pregnant woman (32 weeks) with influenza symptoms × 18 hours. Treatment?

Exercise 9: Oseltamivir Resistance

ICU patient with H1N1 influenza not responding to oseltamivir after 3 days. Next step?

Exercise 10: Secondary Bacterial Infection

Patient with influenza develops productive cough, fever spike on day 5. CXR shows infiltrate. Management?

Exercise 11: Neuropsychiatric Effects

Teenager on oseltamivir develops confusion and agitation. Parent concerns about medication.

Exercise 12: Single-Dose Option

Patient asks about single-dose flu treatment due to poor medication compliance history. Options?

Exercise 13: Prophylaxis Dosing

Healthcare worker exposed to influenza wants prophylaxis. Oseltamivir dosing for prevention?

Exercise 14: Drug Interaction

Patient taking baloxavir also needs calcium carbonate for osteoporosis. Timing considerations?

Exercise 15: Treatment Duration

Immunocompromised patient with influenza improving on oseltamivir day 5. Continue treatment?

Exercise 16: IV vs Oral Route

Hospitalized patient with influenza can't keep oral medications down. IV antiviral options?

Exercise 17: Cost Considerations

Uninsured patient with influenza within 24 hours of onset. Most cost-effective treatment?

Exercise 18: Zanamivir Administration

Patient prescribed zanamivir doesn't understand how to use Diskhaler device. Key teaching points?

Exercise 19: Treatment Failure

Patient completed 5-day oseltamivir course but symptoms persist. Possible causes and management?

Exercise 20: Outbreak Setting

Nursing home influenza outbreak. 85-year-old resident with COPD develops symptoms. Treatment strategy?

Clinical Pearl: Start antivirals within 48 hours for maximum benefit, but don't withhold from high-risk or hospitalized patients regardless of symptom duration. Oseltamivir is safe in pregnancy and preferred for most patients.

Pneumonia (Adult Outpatient)

Community-acquired pneumonia (CAP) in outpatients presents with cough, fever, dyspnea, and chest pain with infiltrate on chest imaging. Empiric antibiotic therapy

targets common bacterial pathogens including Streptococcus pneumoniae and atypical organisms. Risk stratification using CURB-65 or PSI helps determine appropriateness for outpatient management.

Common Pathogens

- Typical bacteria: Streptococcus pneumoniae, Haemophilus influenzae, Moraxella catarrhalis
- Atypical organisms: Mycoplasma pneumoniae, Chlamydophila pneumoniae, Legionella pneumophila
- Viral: Influenza A/B, RSV, SARS-CoV-2, adenovirus
- Aspiration risk: Staphylococcus aureus, anaerobes, gram-negative bacilli

Antibiotic Choices

1. Healthy Adults (No Comorbidities)

First-line:

- Azithromycin 500mg day 1, then 250mg daily × 4 days
- Doxycycline 100mg BID × 5-7 days

2. Adults with Comorbidities

First-line:

- Amoxicillin-clavulanate 875/125mg BID + azithromycin 500mg daily × 5 days
- Levofloxacin 750mg daily × 5 days

3. Penicillin Allergy

Alternatives:

- Levofloxacin 750mg daily × 5 days
- Azithromycin 500mg day 1, then 250mg daily × 4 days

Suspected Atypical Pneumonia

1. Preferred:

- Azithromycin 500mg day 1, then 250mg daily × 4 days
- Doxycycline 100mg BID × 7-10 days

Standard Dosing

1. IV Antibiotics (Emergency Department)

Drug	Adult Dose	Pediatric Dose	Frequency
Ceftriaxone	1-2g	50-100mg/kg/day	Daily
Azithromycin	500mg	10mg/kg	Daily
Levofloxacin	750mg	Not recommended <18yr	Daily
Levofloxacin	3g	200mg/kg/day divided	Q6H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Azithromycin	500mg day 1, then	10mg/kg day 1, then	Daily

	250mg	5mg/kg	
Amoxicillin-clavulanate	875/125mg	45mg/kg/day divided	BID
Levofloxacin	750mg	Not recommended <18yr	Daily
Doxycycline	100mg	Not recommended <18yr	BID
Clarithromycin	500mg	15mg/kg/day divided	BID

3. Renal Adjustments

- Levofloxacin: CrCl 20-49: 750mg Q48H; CrCl 10-19: 500mg Q48H
- Amoxicillin-clavulanate: CrCl <30: 875/125mg daily
- Azithromycin: No adjustment needed
- Doxycycline: No adjustment needed

Organism Coverage

- Azithromycin: Atypicals, S. pneumoniae, H. influenzae, M. catarrhalis
- Amoxicillin-clavulanate: S. pneumoniae, H. influenzae, M. catarrhalis, some anaerobes
- Levofloxacin: Broad spectrum including S. pneumoniae, atypicals, some gram-negatives
- Doxycycline: Atypicals, S. pneumoniae, H. influenzae
- Ceftriaxone: S. pneumoniae, H. influenzae, M. catarrhalis, gram-negatives

Contraindications

- Azithromycin: Hypersensitivity, severe hepatic impairment, QT prolongation
- Levofloxacin: Hypersensitivity, myasthenia gravis, tendon disorders
- Doxycycline: Pregnancy, children <8 years, severe hepatic impairment
- Amoxicillin-clavulanate: Penicillin allergy, previous cholestatic jaundice
- Clarithromycin: Hypersensitivity, concurrent QT-prolonging drugs

Adverse Effects

- Azithromycin: QT prolongation, GI upset, hepatotoxicity, C. difficile
- Levofloxacin: Tendon rupture, CNS effects, QT prolongation, photosensitivity
- Doxycycline: Photosensitivity, GI upset, esophageal irritation
- Amoxicillin-clavulanate: Diarrhea, C. difficile, hepatotoxicity
- Clarithromycin: QT prolongation, metallic taste, drug interactions

Drug Interactions

- Azithromycin: Warfarin (↑INR), digoxin (↑levels), QT-prolonging drugs
- Levofloxacin: Warfarin (↑INR), antacids (↓absorption), QT-prolonging drugs
- Doxycycline: Antacids/iron (↓absorption), warfarin (↑INR), isotretinoin

- Amoxicillin-clavulanate: Warfarin (↑INR), allopurinol (↑rash risk)
- Clarithromycin: CYP3A4 substrates, warfarin, statins, digoxin

Treatment Duration

- Azithromycin: 5 days (Z-pack)
- Levofloxacin: 5 days
- Amoxicillin-clavulanate: 5-7 days
- Doxycycline: 5-10 days
- Clarithromycin: 7-14 days
- Most CAP: 5-7 days adequate; extend to 10 days for atypicals or slow response

PRACTICAL EXERCISES

Exercise 1: Healthy Adult

32-year-old healthy teacher with 3-day history of fever, productive cough, chest pain. CXR shows RLL infiltrate. Treatment?

Exercise 2: Comorbidities Present

68-year-old with diabetes and COPD develops pneumonia. Lives independently. Antibiotic choice?

Exercise 3: Penicillin Allergy

45-year-old with penicillin allergy (anaphylaxis) has CAP. What antibiotic regimen?

Exercise 4: Atypical Pneumonia

28-year-old college student with gradual onset dry cough, fever, headache × 1 week. CXR shows bilateral infiltrates. Treatment?

Exercise 5: Elderly Patient

82-year-old nursing home resident with CHF develops pneumonia. CURB-65 score = 2. Outpatient management appropriate?

Exercise 6: Pregnancy

30-year-old pregnant woman (28 weeks) with pneumonia. Safe antibiotic options?

Exercise 7: Renal Impairment

Patient with CrCl 25 mL/min needs levofloxacin for pneumonia. Dosing adjustment?

Exercise 8: Treatment Duration

Patient with pneumonia improving on azithromycin day 5. Continue treatment or stop?

Exercise 9: Drug Interaction

Patient on warfarin (INR 2.8) prescribed azithromycin for pneumonia. Monitoring plan?

Exercise 10: Treatment Failure

Patient completed 5-day levofloxacin course but symptoms persist. CXR unchanged. Next steps?

Exercise 11: Aspiration Risk

65-year-old with stroke history and dysphagia develops pneumonia. Antibiotic considerations?

Exercise 12: Cost Concerns

Uninsured patient with pneumonia needs treatment. Most cost-effective regimen?

Exercise 13: Macrolide Resistance

Patient with pneumonia in area with high macrolide-resistant S. pneumoniae. Antibiotic choice?

Exercise 14: Fluoroquinolone Contraindication

55-year-old with myasthenia gravis and pneumonia. Avoid which antibiotics?

Exercise 15: Severe Allergy History

Patient allergic to penicillin, macrolides, and fluoroquinolones has pneumonia. Options?

Exercise 16: Hospitalization Decision

72-year-old with pneumonia, confusion, BUN 25, RR 22, BP 110/70. CURB-65 score and disposition?

Exercise 17: Follow-up Timing

Patient started on amoxicillin-clavulanate for pneumonia. When should clinical improvement be seen?

Exercise 18: Antibiotic Duration

Patient with atypical pneumonia on doxycycline improving slowly. Extend treatment duration?

Exercise 19: Combination Therapy

Patient with COPD and pneumonia. Benefits of combination therapy vs monotherapy?

Exercise 20: Prevention Discussion

65-year-old recovering from pneumonia asks about prevention. Vaccination recommendations?

Clinical Pearl: For outpatient CAP, azithromycin alone works for healthy adults, but add amoxicillin-clavulanate for patients with comorbidities. Levofloxacin 750mg daily × 5 days is excellent monotherapy for most patients without fluoroquinolone contraindications.

Pneumonia (Pediatric)

Pediatric community-acquired pneumonia (CAP) presents with fever, cough, tachypnea, and respiratory distress, with age-specific pathogens varying significantly. Viral pneumonia is most common in children <5 years, while bacterial pneumonia increases with age. Clinical signs may be subtle in infants, requiring high index of suspicion and age-appropriate antibiotic selection.

Common Pathogens

- Neonates (0-3 months): Group B Streptococcus, E. coli, Listeria monocytogenes, Chlamydia trachomatis
- Infants (3-24 months): Streptococcus pneumoniae, Haemophilus influenzae, RSV, rhinovirus

- Preschool (2-5 years): S. pneumoniae, Mycoplasma pneumoniae, viral (RSV, parainfluenza, adenovirus)
- School age (>5 years): S. pneumoniae, Mycoplasma pneumoniae, Chlamydophila pneumoniae
- Complicated pneumonia: Staphylococcus aureus (including MRSA), Group A Streptococcus

Antibiotic Choices

1. Typical Bacterial Pneumonia

First-line:

- Amoxicillin 80-90mg/kg/day divided TID × 7-10 days
- Ampicillin 200mg/kg/day divided QID (hospitalized)

2. Atypical Pneumonia (>5 years)

First-line:

- Azithromycin 10mg/kg day 1, then 5mg/kg daily × 4 days
- Clarithromycin 15mg/kg/day divided BID × 7-10 days

3. Severe/Hospitalized

First-line:

- Ampicillin 200mg/kg/day IV QID + azithromycin 10mg/kg IV daily
- Ceftriaxone 50-100mg/kg/day IV daily

4. MRSA Coverage (Complicated)

Add:

- Clindamycin 30-40mg/kg/day divided TID-QID
- Vancomycin 40-60mg/kg/day divided Q6-8H

Standard Dosing

1. IV Antibiotics

Drug	Neonatal Dose	Pediatric Dose	Adult Dose	Frequency
Ampicillin	50-100mg/kg/day	200mg/kg/day	2g	Q6-8H
Ceftriaxone	50mg/kg/day	50-100mg/kg/day	1-2g	Daily
Azithromycin	10mg/kg	10mg/kg	500mg	Daily
Vancomycin	30-45mg/kg/day	40-60mg/kg/day	15-20mg/kg	Q6-12H
Clindamycin	15-25mg/kg/day	30-40mg/kg/day	600-900mg	Q6-8H

2. Oral Antibiotics

Drug	Neonatal Dose	Pediatric Dose	Adult Dose	Frequency
Amoxicillin	20-30mg/kg/day	80-90mg/kg/day	875 mg	TID
Azithromycin	10mg/kg day 1, then	10mg/kg day 1, then	500 mg	Daily

	5mg/kg	5mg/kg	day 1, then 250 mg	
Clarithromycin	15mg/kg/day	15mg/kg/day	500 mg	BID
Clindamycin	15-25mg/kg/day	30-40mg/kg/day	300-450 mg	TID-QID
Cephalexin	25-50mg/kg/day	50-100mg/kg/day	500 mg	QID

3. Renal Adjustments

- Amoxicillin: Reduce dose 50% if severe renal impairment
- Ceftriaxone: Monitor in severe renal impairment
- Azithromycin: No adjustment needed
- Vancomycin: Adjust based on levels and renal function

Organism Coverage

- Amoxicillin: S. pneumoniae, H. influenzae (non-beta-lactamase), Group A Strep
- Azithromycin: Atypicals (Mycoplasma, Chlamydophila), S. pneumoniae, H. influenzae
- Ceftriaxone: S. pneumoniae, H. influenzae, M. catarrhalis, many gram-negatives
- Clindamycin: S. aureus (including some MRSA), S. pneumoniae, anaerobes
- Vancomycin: MRSA, methicillin-resistant coagulase-negative Staphylococci

Contraindications

- Amoxicillin: Penicillin allergy, infectious mononucleosis
- Azithromycin: Hypersensitivity, severe hepatic impairment
- Ceftriaxone: Penicillin allergy (cross-reactivity), hyperbilirubinemia in neonates
- Clindamycin: Hypersensitivity, previous C. difficile colitis
- Vancomycin: Hypersensitivity, previous "red man syndrome"

Adverse Effects

- Amoxicillin: Rash, diarrhea, allergic reactions
- Azithromycin: GI upset, prolonged QT (rare in children)
- Ceftriaxone: Biliary sludging, C. difficile, hemolysis (rare)
- Clindamycin: C. difficile colitis, GI upset, rash
- Vancomycin: Nephrotoxicity, ototoxicity, "red man syndrome"

Drug Interactions

- Amoxicillin: Warfarin (↑INR), oral contraceptives (↓effectiveness)
- Azithromycin: Limited in children, avoid with other QT-prolonging drugs
- Ceftriaxone: Calcium-containing solutions (precipitation)
- Clindamycin: Neuromuscular blocking agents (↑paralysis)
- Vancomycin: Aminoglycosides (↑nephrotoxicity), loop diuretics

Treatment Duration

- Uncomplicated pneumonia: 7-10 days
- Atypical pneumonia: 5-7 days (azithromycin), 7-10 days (clarithromycin)
- Severe/complicated pneumonia: 10-14 days
- MRSA pneumonia: 7-21 days depending on severity
- Neonatal pneumonia: 10-14 days minimum

PRACTICAL EXERCISES

Exercise 1: Toddler Pneumonia

18-month-old with fever, cough, increased work of breathing. CXR shows RLL consolidation. Weight 12kg. Treatment?

Exercise 2: School-Age Atypical

8-year-old with gradual onset dry cough, low-grade fever × 5 days. CXR shows bilateral interstitial infiltrates. Treatment?

Exercise 3: Severe Pneumonia

4-year-old admitted with high fever, respiratory distress, large pleural effusion. Empiric antibiotic choice?

Exercise 4: Penicillin Allergy

6-year-old with pneumonia has penicillin allergy (hives). Alternative antibiotic for typical bacterial pneumonia?

Exercise 5: Neonatal Pneumonia

3-week-old with respiratory distress, apnea, temperature instability. Antibiotic regimen?

Exercise 6: Dosing Calculation

25kg, 7-year-old needs amoxicillin for pneumonia. Calculate appropriate dose and frequency.

Exercise 7: MRSA Pneumonia

12-year-old with necrotizing pneumonia, MRSA isolated from pleural fluid. Treatment adjustment?

Exercise 8: Treatment Duration

5-year-old improving on amoxicillin day 7 for pneumonia. Continue treatment or stop?

Exercise 9: Hospitalization Decision

3-year-old with pneumonia, RR 45, O2 sat 94% on room air, taking fluids well. Admit or outpatient?

Exercise 10: Treatment Failure

Child completed 7 days amoxicillin for pneumonia but fever returns. CXR shows progression. Next steps?

Exercise 11: Complicated Pneumonia

10-year-old with pneumonia develops empyema. Antibiotic considerations beyond drainage?

Exercise 12: Infant Pneumonia

6-month-old with bronchiolitis vs pneumonia. When to start antibiotics?

Exercise 13: Macrolide Resistance

Area with high macrolide-resistant S. pneumoniae. 9-year-old with typical bacterial pneumonia. Treatment?

Exercise 14: Vancomycin Levels

Child on vancomycin for MRSA pneumonia. Trough level 18 mcg/mL. Action needed?

Exercise 15: Aspiration Pneumonia

4-year-old with cerebral palsy and dysphagia develops pneumonia. Antibiotic choice?

Exercise 16: Step-Down Therapy

Child improving on IV ceftriaxone for pneumonia. Criteria for switching to oral antibiotics?

Exercise 17: Recurrent Pneumonia

7-year-old with 3rd episode of pneumonia this year. Additional considerations?

Exercise 18: Allergic Reaction

Child on amoxicillin develops generalized rash day 3. Continue or change antibiotics?

Exercise 19: Immunocompromised

Child with leukemia develops pneumonia. Antibiotic modifications needed?

Exercise 20: Prevention Discussion

Parent asks about preventing pneumonia in their 2-year-old. Vaccination recommendations?

Clinical Pearl: Use high-dose amoxicillin (80-90mg/kg/day) for typical bacterial pneumonia in children to overcome pneumococcal resistance. For children >5 years with atypical features, add azithromycin. Always consider age-specific pathogens when selecting empiric therapy.

Tuberculosis

Tuberculosis (TB) is a chronic infection caused primarily by Mycobacterium tuberculosis, requiring prolonged multi-drug

therapy to prevent resistance development. Treatment consists of an intensive phase (2 months) followed by a continuation phase (4-7 months), with directly observed therapy (DOT) recommended for all patients. Drug susceptibility testing guides therapy, with first-line agents preferred when organisms are susceptible.

Common Pathogens

- Mycobacterium tuberculosis complex: M. tuberculosis, M. bovis, M. africanum
- Drug-susceptible TB: Responds to first-line anti-TB drugs
- Drug-resistant TB: Isoniazid-resistant (INH-R), rifampin-resistant (RIF-R)
- Multidrug-resistant TB (MDR-TB): Resistant to both isoniazid and rifampin
- Extensively drug-resistant TB (XDR-TB): MDR-TB plus resistance to fluoroquinolone and second-line injectable

Antibiotic Choices

1. Drug-Susceptible TB (Initial Treatment)

Intensive Phase (2 months):

- Isoniazid + Rifampin + Ethambutol + Pyrazinamide (HREP)

Continuation Phase (4 months):

- Isoniazid + Rifampin (HR)

2. Isoniazid-Resistant TB

Intensive Phase (2 months):

- Rifampin + Ethambutol + Pyrazinamide + Fluoroquinolone

Continuation Phase (7 months):

- Rifampin + Ethambutol

3. MDR-TB/RIF-Resistant TB

Treatment (18-24 months):

- Bedaquiline + Pretomanid + Linezolid (BPaL regimen)
- Or 4-6 drugs based on susceptibility testing

Standard Dosing

1. IV Antibiotics (When Oral Not Possible)

Drug	Adult Dose	Pediatric Dose	Adult Frequency
Isoniazid	300mg	10-15mg/kg (max 300mg)	Daily
Rifampin	600mg	10-20mg/kg (max 600mg)	Daily
Ethambutol	15-25mg/kg	15-25mg/kg	Daily
Streptomycin	15mg/kg	20-40mg/kg (max 1g)	Daily
Amikacin	15mg/kg	15-30mg/kg	

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Adult Frequency

Isoniazid	300mg	10-15mg/kg (max 300mg)	Daily
Rifampin	600mg	10-20mg/kg (max 600mg)	Daily
Ethambutol	15-25mg/kg	15-25mg/kg	Daily
Pyrazinamide	25mg/kg	35mg/kg	Daily
Levofloxacin	750-1000mg	15-20mg/kg	Daily
Linezolid	600mg	10mg/kg (max 600mg)	Daily

3. Renal Adjustments

- Isoniazid: No adjustment needed
- Rifampin: No adjustment needed
- Ethambutol: Avoid if CrCl <50 (ocular toxicity risk)
- Pyrazinamide: Avoid if CrCl <30
- Streptomycin: Reduce dose if CrCl <80

Organism Coverage

- Isoniazid: Mycobacteria (bactericidal for actively dividing organisms)
- Rifampin: Mycobacteria (bactericidal, sterilizing activity)
- Ethambutol: Mycobacteria (bacteriostatic, prevents resistance)
- Pyrazinamide: Mycobacteria (bactericidal in acidic environment)
- Fluoroquinolones: Mycobacteria (bactericidal, second-line agent)

- Bedaquiline: Mycobacteria (bactericidal, targets ATP synthase)

Contraindications

- Isoniazid: Active hepatitis, previous isoniazid hepatotoxicity
- Rifampin: Hypersensitivity, concurrent protease inhibitors
- Ethambutol: Optic neuritis, inability to monitor vision
- Pyrazinamide: Severe hepatic impairment, acute gout
- Streptomycin: Pregnancy, 8th cranial nerve damage, myasthenia gravis

Adverse Effects

- Isoniazid: Hepatotoxicity, peripheral neuropathy, drug-induced lupus
- Rifampin: Hepatotoxicity, orange discoloration, flu-like syndrome
- Ethambutol: Optic neuritis, red-green color blindness
- Pyrazinamide: Hepatotoxicity, hyperuricemia, arthralgias
- Streptomycin: Ototoxicity, nephrotoxicity, vestibular toxicity

Drug Interactions

- Isoniazid: Phenytoin (↑levels), warfarin (↑INR), acetaminophen (↑toxicity)
- Rifampin: CYP450 inducer (↓levels of many drugs), warfarin, oral contraceptives
- Ethambutol: Minimal interactions
- Pyrazinamide: Minimal interactions

- Fluoroquinolones: Antacids (↓absorption), warfarin (↑INR)

Treatment Duration

- Drug-susceptible TB: 6 months total (2 months HREP, then 4 months HR)
- Isoniazid-resistant TB: 9 months total (2 months REP + fluoroquinolone, then 7 months RE)
- MDR-TB: 18-24 months of effective therapy
- Extrapulmonary TB: 6-12 months depending on site
- TB meningitis: 9-12 months minimum
- Continue treatment until culture-negative × 3 consecutive specimens

PRACTICAL EXERCISES

Exercise 1: Initial TB Treatment

35-year-old with newly diagnosed pulmonary TB, drug-susceptible. Standard initial treatment regimen?

Exercise 2: Pediatric Dosing

25kg, 8-year-old with TB. Calculate isoniazid and rifampin doses.

Exercise 3: Isoniazid-Resistant TB

Patient's isolate shows isoniazid resistance, rifampin-susceptible. Treatment modification?

Exercise 4: Hepatotoxicity Monitoring

Patient on HREP develops ALT 150 U/L (normal <40). Management approach?

Exercise 5: Vision Changes

Patient on ethambutol reports difficulty distinguishing red and green colors. Action needed?

Exercise 6: Drug Interaction

TB patient on rifampin also takes warfarin for atrial fibrillation. INR monitoring plan?

Exercise 7: Treatment Duration Decision

Patient completed 6 months of treatment, clinically improved but last sputum culture positive. Continue treatment?

Exercise 8: MDR-TB Treatment

Patient with MDR-TB (resistant to isoniazid and rifampin). Treatment options?

Exercise 9: Renal Impairment

TB patient with CrCl 25 mL/min. Which first-line drugs require adjustment?

Exercise 10: Pregnancy

28-year-old pregnant woman (20 weeks) diagnosed with TB. Safe treatment regimen?

Exercise 11: Treatment Failure

Patient on standard therapy for 4 months, still culture-positive. Possible causes and next steps?

Exercise 12: Directly Observed Therapy

Homeless patient with TB has poor medication adherence. DOT considerations?

Exercise 13: TB Meningitis

45-year-old with TB meningitis. Treatment duration and drug considerations?

Exercise 14: Neuropathy Prevention

Patient starting isoniazid has diabetes and malnutrition. Additional supplementation needed?

Exercise 15: Rifampin Side Effects

Patient concerned about orange urine after starting rifampin. Counseling points?

Exercise 16: Contact Investigation

Healthcare worker diagnosed with active TB. Workplace exposure considerations?

Exercise 17: Treatment Completion

Patient completed 6 months of therapy, symptom-free, weight gained. Criteria for cure?

Exercise 18: Drug Resistance Testing

New TB diagnosis. When should drug susceptibility testing be obtained?

Exercise 19: Extrapulmonary TB

Patient with TB lymphadenitis. Treatment duration compared to pulmonary TB?

Exercise 20: Latent TB Treatment

65-year-old with positive IGRA, normal CXR. Treatment for latent TB infection?

Clinical Pearl: Always start with 4-drug therapy (HREP) for suspected TB until susceptibilities known. Monitor LFTs monthly for hepatotoxicity, and ensure vitamin B6 supplementation with isoniazid in high-risk patients.

Treatment success requires completion of full duration plus culture conversion.

CHAPTER 11: SKIN & SOFT TISSUE INFECTIONS

Animal/Human Bite Wounds

Bite wounds carry high infection risk due to deep tissue penetration and polymicrobial flora from oral cavity of biting animal or human. Prophylactic antibiotics are indicated for moderate-to-severe bites, puncture wounds, hand injuries, or immunocompromised patients. Treatment must cover both aerobic and anaerobic organisms specific to the biting species.

Common Pathogens

- Dog bites: Pasteurella multocida, Staphylococcus aureus, Streptococcus spp., Capnocytophaga canimorsus
- Cat bites: Pasteurella multocida (80%), Streptococcus spp., Staphylococcus aureus, anaerobes
- Human bites: Streptococcus spp., Staphylococcus aureus, Eikenella corrodens, anaerobes, Haemophilus spp.
- Anaerobes (all bites): Bacteroides spp., Prevotella spp., Fusobacterium spp., Peptostreptococcus spp.
- Rabies risk: Bats, raccoons, skunks, foxes, unvaccinated dogs/cats

Antibiotic Choices

1. Prophylaxis (Uninfected Wounds)

First-line:

- Amoxicillin-clavulanate 875/125mg PO BID × 3-5 days
- Ampicillin-sulbactam 3g IV Q6H × 3-5 days

2. Established Infection

First-line:

- Amoxicillin-clavulanate 875/125mg PO BID × 7-10 days
- Ampicillin-sulbactam 3g IV Q6H × 7-10 days

3. Penicillin Allergy (Mild)

Alternative:

- Cefuroxime 500mg PO BID + metronidazole 500mg PO TID
- Cefoxitin 2g IV Q6H

4. Penicillin Allergy (Severe)

Alternative:

- Doxycycline 100mg PO BID + metronidazole 500mg PO TID
- Clindamycin 450mg PO TID + fluoroquinolone

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Adult Frequency
Ampicillin-sulbactam	3g	200mg/kg/day divided	Q6H

Cefoxitin	2g	160mg/kg/day divided	Q6H
Ertapenem	1g	15mg/kg (max 1g)	Daily
Piperacillin-tazobactam	4.5g	300mg/kg/day divided	Q6H
Clindamycin	600-900mg	25-40mg/kg/day divided	Q8H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Adult Frequency
Amoxicillin-clavulanate	875/125mg	45mg/kg/day divided	BID
Cefuroxime	500mg	30mg/kg/day divided	BID
Doxycycline	100mg	Not recommended <8yr	BID
Clindamycin	450mg	25-40mg/kg/day divided	TID
Metronidazole	500mg	30mg/kg/day divided	TID

3. Renal Adjustments

- Amoxicillin-clavulanate: CrCl <30: 875/125mg daily
- Cefuroxime: CrCl <20: Reduce dose 50%
- Metronidazole: No adjustment needed

- Clindamycin: No adjustment needed

Organism Coverage

- Amoxicillin-clavulanate: Pasteurella, Staphylococcus, Streptococcus, anaerobes, beta-lactamase producers
- Doxycycline: Pasteurella, Staphylococcus, Streptococcus, some anaerobes
- Clindamycin: Staphylococcus, Streptococcus, excellent anaerobic coverage
- Metronidazole: Excellent anaerobic coverage, no aerobic activity
- Fluoroquinolones: Pasteurella, gram-negatives, limited anaerobic coverage

Contraindications

- Amoxicillin-clavulanate: Penicillin allergy, previous cholestatic jaundice
- Doxycycline: Pregnancy, children <8 years, severe hepatic impairment
- Metronidazole: First trimester pregnancy, alcohol use (disulfiram reaction)
- Clindamycin: Previous C. difficile colitis, severe hepatic impairment
- Fluoroquinolones: Children <18 years, pregnancy, tendon disorders

Adverse Effects

- Amoxicillin-clavulanate: Diarrhea, C. difficile, hepatotoxicity, rash
- Doxycycline: Photosensitivity, GI upset, esophageal irritation

- Metronidazole: Metallic taste, disulfiram reaction, peripheral neuropathy
- Clindamycin: C. difficile colitis, GI upset, rash
- Cefuroxime: C. difficile, allergic reactions, GI upset

Drug Interactions

- Amoxicillin-clavulanate: Warfarin (↑INR), allopurinol (↑rash risk)
- Doxycycline: Antacids (↓absorption), warfarin (↑INR), isotretinoin
- Metronidazole: Warfarin (↑INR), alcohol (disulfiram reaction), lithium
- Clindamycin: Neuromuscular blocking agents (↑paralysis)
- Fluoroquinolones: Antacids (↓absorption), warfarin (↑INR)

Treatment Duration

- Prophylaxis: 3-5 days for uninfected wounds
- Mild infection: 7-10 days
- Moderate-severe infection: 10-14 days
- Deep tissue infection: 14-21 days
- Osteomyelitis: 4-6 weeks minimum
- Start within 12-24 hours for optimal prophylaxis effectiveness

PRACTICAL EXERCISES

Exercise 1: Dog Bite Prophylaxis

45-year-old bitten by neighbor's dog on forearm. Puncture wounds, not infected. Prophylaxis needed?

Exercise 2: Cat Bite Hand

32-year-old with cat bite to right hand, swelling and erythema developing. Treatment approach?

Exercise 3: Human Bite Infection

28-year-old with infected human bite ("fight bite") over knuckle. Antibiotic choice?

Exercise 4: Pediatric Dog Bite

8-year-old, 25kg child with dog bite requiring prophylaxis. Calculate amoxicillin-clavulanate dose.

Exercise 5: Penicillin Allergy

Patient with severe penicillin allergy has infected cat bite. Alternative antibiotic regimen?

Exercise 6: Pregnancy

26-year-old pregnant woman (18 weeks) with dog bite requiring antibiotics. Safe options?

Exercise 7: Treatment Duration

Patient with superficial dog bite started on prophylaxis. How long to treat?

Exercise 8: Deep Tissue Infection

Diabetic patient with cat bite developed deep space infection of hand. Treatment duration?

Exercise 9: Immunocompromised Patient

HIV patient with CD4 50 has minor cat scratch. Prophylaxis considerations?

Exercise 10: Treatment Failure

Patient on amoxicillin-clavulanate for bite infection not improving after 5 days. Next steps?

Exercise 11: Rabies Consideration

Patient bitten by stray bat. Wound care and prophylaxis considerations beyond antibiotics?

Exercise 12: Elderly Patient

82-year-old with dog bite, taking warfarin for AFib. Antibiotic choice and monitoring?

Exercise 13: Late Presentation

Patient presents 48 hours after dog bite with early cellulitis. Antibiotic approach?

Exercise 14: Renal Impairment

Patient with CrCl 20 mL/min has infected human bite. Dosing adjustments needed?

Exercise 15: Diabetic Foot Bite

Diabetic patient bitten by dog on foot, developing cellulitis. Special considerations?

Exercise 16: Drug Interaction

Patient on metronidazole for bite infection asks about drinking alcohol. Counseling?

Exercise 17: Surgical Consultation

When should surgical consultation be obtained for bite wounds?

Exercise 18: Tetanus Status

Patient with bite wound, last tetanus shot 7 years ago. Tetanus prophylaxis needed?

Exercise 19: Culture Results

Bite wound culture shows MRSA. Treatment modification needed?

Exercise 20: Prevention Counseling

Parent asks about preventing bite infections in children. Key prevention strategies?

Clinical Pearl: Amoxicillin-clavulanate is first-line for most bite wounds due to excellent coverage of Pasteurella, Staphylococcus, Streptococcus, and anaerobes. Cat bites and hand wounds have highest infection rates and almost always need antibiotics. Start prophylaxis within 12-24 hours for maximum effectiveness.

Bartholin's Cyst/Abscess

Bartholin's gland cysts result from ductal obstruction, while abscesses develop from secondary bacterial infection of the cyst. Simple cysts are usually asymptomatic and don't require antibiotics, but infected abscesses present with pain, swelling, and erythema requiring drainage plus antibiotic therapy. Treatment focuses on broad-spectrum coverage for mixed aerobic and anaerobic flora.

Common Pathogens

- Polymicrobial infection: Mix of aerobic and anaerobic organisms
- Aerobic bacteria: Escherichia coli, Staphylococcus aureus, Streptococcus spp., Enterococcus spp.

- Anaerobic bacteria: Bacteroides spp., Prevotella spp., Peptostreptococcus spp., Clostridium spp.
- Sexually transmitted: Neisseria gonorrhoeae, Chlamydia trachomatis (less common)
- Gram-negative enteric: Klebsiella pneumoniae, Enterobacter spp., Pseudomonas aeruginosa (rarely)

Antibiotic Choices

1. Outpatient Treatment (Post-Drainage)

First-line:

- Amoxicillin-clavulanate 875/125mg PO BID × 7-10 days
- Clindamycin 450mg PO TID × 7-10 days

2. Inpatient/Severe Infection

First-line:

- Ampicillin-sulbactam 3g IV Q6H × 7-10 days
- Clindamycin 600-900mg IV Q8H + gentamicin 5mg/kg IV daily

3. Penicillin Allergy

Alternative:

- Doxycycline 100mg PO BID + metronidazole 500mg PO TID
- Levofloxacin 750mg daily + metronidazole 500mg TID

4. MRSA Coverage (If Indicated)

Add:

- Vancomycin 15-20mg/kg IV Q8-12H

- Linezolid 600mg PO/IV BID

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Adult Frequency
Ampicillin-sulbactam	3g	200mg/kg/day divided	Q6H
Clindamycin	600-900mg	25-40mg/kg/day divided	Q8H
Gentamicin	5-7mg/kg	5-7mg/kg	Q24H
Vancomycin	15-20mg/kg	40-60mg/kg/day divided	Q8-12H
Metronidazole	500mg	30mg/kg/day divided	Q8H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Adult Frequency
Amoxicillin-clavulanate	875/125mg	45mg/kg/day divided	BID
Clindamycin	450mg	25-40mg/kg/day divided	TID
Doxycycline	100mg	4mg/kg/day divided	BID

Metronidazole	500mg	30mg/kg/day divided	TID
Levofloxacin	750mg	Not recommended <18yr	Daily

3. Renal Adjustments

- Amoxicillin-clavulanate: CrCl <30: 875/125mg daily
- Gentamicin: Adjust based on levels and renal function
- Vancomycin: Adjust based on levels and renal function
- Levofloxacin: CrCl 20-49: 750mg Q48H
- Metronidazole: No adjustment needed

Organism Coverage

- Amoxicillin-clavulanate: Broad spectrum including E. coli, Staphylococcus, anaerobes, beta-lactamase producers
- Clindamycin: Excellent anaerobic coverage, Staphylococcus, limited gram-negative coverage
- Gentamicin: Gram-negative aerobic bacteria, synergistic with cell wall agents
- Metronidazole: Excellent anaerobic coverage, no aerobic activity
- Levofloxacin: Broad gram-negative and gram-positive coverage, limited anaerobic activity

Contraindications

- Amoxicillin-clavulanate: Penicillin allergy, previous cholestatic jaundice
- Clindamycin: Previous C. difficile colitis, severe hepatic impairment

- Doxycycline: Pregnancy, severe hepatic impairment
- Metronidazole: First trimester pregnancy, alcohol use (disulfiram reaction)
- Levofloxacin: Pregnancy, tendon disorders, myasthenia gravis

Adverse Effects

- Amoxicillin-clavulanate: Diarrhea, C. difficile, hepatotoxicity, vaginal candidiasis
- Clindamycin: C. difficile colitis, GI upset, rash, metallic taste
- Gentamicin: Nephrotoxicity, ototoxicity, vestibular toxicity
- Metronidazole: Metallic taste, disulfiram reaction, peripheral neuropathy
- Vancomycin: "Red man syndrome," nephrotoxicity, ototoxicity

Drug Interactions

- Amoxicillin-clavulanate: Warfarin (↑INR), allopurinol (↑rash risk)
- Clindamycin: Neuromuscular blocking agents (↑paralysis)
- Gentamicin: Vancomycin (↑nephrotoxicity), loop diuretics (↑ototoxicity)
- Metronidazole: Warfarin (↑INR), alcohol (disulfiram reaction), lithium
- Levofloxacin: Warfarin (↑INR), antacids (↓absorption)

Treatment Duration

- Simple drainage: No antibiotics needed if complete drainage achieved
- Cellulitis/mild infection: 7-10 days oral antibiotics
- Abscess with systemic symptoms: 7-10 days (may start IV, then oral)
- Recurrent/complicated infection: 10-14 days
- Immunocompromised patients: 10-14 days minimum
- Continue until resolution of erythema and tenderness

PRACTICAL EXERCISES

Exercise 1: Simple Abscess

28-year-old with painful Bartholin's abscess, successfully drained. Minimal surrounding cellulitis. Antibiotics needed?

Exercise 2: Post-Drainage Cellulitis

32-year-old post I&D of Bartholin's abscess with surrounding erythema and tenderness. Outpatient antibiotic choice?

Exercise 3: Severe Infection

25-year-old with large Bartholin's abscess, fever 101.5°F, unable to walk due to pain. Treatment approach?

Exercise 4: Penicillin Allergy

35-year-old allergic to penicillin (anaphylaxis) needs treatment for infected Bartholin's cyst. Alternative regimen?

Exercise 5: Pregnancy

26-year-old pregnant woman (22 weeks) with Bartholin's abscess requiring antibiotics. Safe options?

Exercise 6: Recurrent Infection

30-year-old with third Bartholin's abscess in 6 months. Treatment considerations?

Exercise 7: Treatment Duration

Patient started on clindamycin for Bartholin's abscess, improving after 5 days. Continue treatment?

Exercise 8: MRSA Coverage

Patient with history of MRSA infections develops Bartholin's abscess. Antibiotic modification needed?

Exercise 9: Diabetic Patient

38-year-old diabetic with poorly controlled glucose develops Bartholin's abscess. Special considerations?

Exercise 10: Treatment Failure

Patient on amoxicillin-clavulanate for 5 days, worsening erythema and pain. Next steps?

Exercise 11: Adolescent Patient

16-year-old sexually active with Bartholin's abscess. Additional testing and treatment considerations?

Exercise 12: Immunocompromised

HIV patient with CD4 200 develops Bartholin's abscess. Treatment modifications?

Exercise 13: Culture Results

Culture from Bartholin's abscess shows E. coli and Bacteroides. Current therapy adequate?

Exercise 14: Drug Interaction

Patient on warfarin develops Bartholin's abscess, prescribed amoxicillin-clavulanate. Monitoring needed?

Exercise 15: Renal Impairment

Patient with CrCl 25 mL/min needs treatment for Bartholin's abscess. Dosing adjustments?

Exercise 16: Prevention Discussion

Patient with recurrent Bartholin's cysts asks about prevention strategies. Recommendations?

Exercise 17: Surgical Consultation

When should surgical consultation be considered for Bartholin's gland disease?

Exercise 18: Pain Management

Patient post-drainage experiencing significant pain. Pain management recommendations?

Exercise 19: Follow-up Timing

Patient treated for Bartholin's abscess as outpatient. When should follow-up be scheduled?

Exercise 20: Complicated Drainage

Bartholin's abscess drainage yielded minimal purulent material. Antibiotic approach?

Clinical Pearl: Most Bartholin's abscesses require drainage as primary treatment. Antibiotics alone are insufficient for established abscesses. Amoxicillin-clavulanate provides excellent coverage for the typical polymicrobial flora. Consider marsupialization for recurrent episodes to prevent future obstruction.

Cellulitis and Abscess

Cellulitis presents as spreading erythema, warmth, and tenderness of skin and subcutaneous tissues, while abscesses are localized collections of purulent material requiring drainage. Non-purulent cellulitis is typically caused by streptococci, while purulent infections often involve Staphylococcus aureus including MRSA. MRSA coverage should be considered for purulent infections, recurrent cellulitis, or high-risk patients.

Common Pathogens

- Non-purulent cellulitis: Streptococcus pyogenes (Group A Strep), Streptococcus agalactiae (Group B Strep)
- Purulent cellulitis/abscess: Staphylococcus aureus (MSSA and MRSA), Streptococcus pyogenes
- Diabetic foot infections: Mixed aerobic/anaerobic, Pseudomonas aeruginosa, Enterococcus spp.
- Immunocompromised: Pseudomonas aeruginosa, Enterobacteriaceae, Candida spp.
- Water exposure: Aeromonas spp., Vibrio vulnificus, atypical mycobacteria

Antibiotic Choices

1. Non-Purulent Cellulitis (Mild-Moderate)

First-line:

- Cephalexin 500mg PO QID × 5-10 days
- Clindamycin 300-450mg PO TID × 5-10 days

2. Purulent Cellulitis/Abscess (MRSA Coverage)

First-line:

- Clindamycin 300-450mg PO TID × 5-10 days
- Doxycycline 100mg PO BID × 5-10 days
- Trimethoprim-sulfamethoxazole 1-2 DS tablets PO BID × 5-10 days

3. Severe Cellulitis (Hospitalized)

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H
- Linezolid 600mg IV/PO BID
- Daptomycin 4mg/kg IV daily (skin infections)

4. Diabetic Foot/Complicated Infections

Broad spectrum:

- Piperacillin-tazobactam 4.5g IV Q6H
- Vancomycin + piperacillin-tazobactam

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Adult Frequency
Vancomycin	15-20mg/kg	40-60mg/kg/day divided	Q8-12H
Linezolid	600mg	30mg/kg/day divided	BID
Daptomycin	4mg/kg	6-12mg/kg	Daily
Cefazolin	1-2g	100mg/kg/day divided	Q8H

Clindamycin	600-900mg	25-40mg/kg/day divided	Q8H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Adult Frequency
Cephalexin	500mg	50-100mg/kg/day divided	QID
Clindamycin	300-450mg	25-40mg/kg/day divided	TID
Doxycycline	100mg	Not recommended <8yr	BID
TMP-SMX	1-2 DS tablets	8-12mg/kg/day TMP	BID
Linezolid	600mg	30mg/kg/day divided	BID

3. Renal Adjustments

- Vancomycin: Adjust based on levels and renal function
- TMP-SMX: CrCl <30: Reduce dose 50%
- Linezolid: No adjustment needed
- Daptomycin: CrCl <30: Reduce frequency to Q48H
- Cephalexin: CrCl <50: Reduce dose by 50%

Organism Coverage

- Cephalexin: Staphylococcus aureus (MSSA), Streptococcus spp., no MRSA coverage
- Clindamycin: MSSA, MRSA (if susceptible), Streptococcus spp., anaerobes
- Vancomycin: MRSA, MSSA, Streptococcus spp., Enterococcus (vancomycin-sensitive)
- Doxycycline: MSSA, MRSA (if susceptible), Streptococcus spp.
- TMP-SMX: MSSA, MRSA (if susceptible), gram-negatives

Contraindications

- Cephalexin: Penicillin/cephalosporin allergy
- Clindamycin: Previous C. difficile colitis, severe hepatic impairment
- Vancomycin: Hypersensitivity, previous "red man syndrome"
- Doxycycline: Pregnancy, children <8 years, severe hepatic impairment
- TMP-SMX: Sulfa allergy, severe renal impairment, pregnancy (third trimester)

Adverse Effects

- Cephalexin: GI upset, allergic reactions, C. difficile (rare)
- Clindamycin: C. difficile colitis, GI upset, rash
- Vancomycin: "Red man syndrome," nephrotoxicity, ototoxicity
- Doxycycline: Photosensitivity, GI upset, esophageal irritation

- TMP-SMX: Rash, hyperkalemia, bone marrow suppression

Drug Interactions

- Cephalexin: Warfarin (↑INR), metformin (↑levels)
- Clindamycin: Neuromuscular blocking agents (↑paralysis)
- Vancomycin: Aminoglycosides (↑nephrotoxicity), loop diuretics
- Doxycycline: Antacids (↓absorption), warfarin (↑INR)
- TMP-SMX: Warfarin (↑INR), ACE inhibitors (↑hyperkalemia)

Treatment Duration

- Mild cellulitis: 5-7 days
- Moderate cellulitis: 7-10 days
- Severe cellulitis: 10-14 days
- Abscess (post-drainage): 5-7 days if drained completely
- Diabetic foot infections: 10-14 days (mild), 2-4 weeks (severe)
- Necrotizing infections: 10-14 days minimum
- Extend duration if slow response or immunocompromised

PRACTICAL EXERCISES

Exercise 1: Simple Cellulitis

45-year-old with non-purulent cellulitis of lower leg, no systemic symptoms. Outpatient treatment?

Exercise 2: MRSA Risk Factors

32-year-old IV drug user with purulent abscess on arm. Antibiotic choice after I&D?

Exercise 3: Severe Cellulitis

68-year-old diabetic with extensive cellulitis, fever 102°F, leukocytosis. Hospitalization and treatment?

Exercise 4: Pediatric Cellulitis

8-year-old, 25kg with facial cellulitis. Calculate cephalexin dose.

Exercise 5: Penicillin Allergy

Patient with severe penicillin allergy has non-purulent cellulitis. Alternative antibiotic?

Exercise 6: Treatment Duration

Patient with cellulitis improving after 5 days of cephalexin. Continue treatment?

Exercise 7: MRSA Coverage

Nursing home resident with recurrent cellulitis. Risk factors for MRSA coverage?

Exercise 8: Diabetic Foot

Diabetic patient with infected foot ulcer, foul odor, tracking erythema. Antibiotic approach?

Exercise 9: Culture Results

Cellulitis culture shows MRSA sensitive to clindamycin but inducible resistance positive. Treatment adjustment?

Exercise 10: Treatment Failure

Patient on cephalexin for 4 days with worsening cellulitis. Next steps?

Exercise 11: Immunocompromised

HIV patient with CD4 100 develops cellulitis. Treatment modifications needed?

Exercise 12: Drug Interaction

Patient on warfarin develops cellulitis, prescribed TMP-SMX. Monitoring requirements?

Exercise 13: Abscess Management

Large abscess successfully drained, minimal surrounding cellulitis. Antibiotics needed?

Exercise 14: Renal Impairment

Patient with CrCl 20 mL/min needs vancomycin for severe cellulitis. Dosing considerations?

Exercise 15: Pregnancy

28-year-old pregnant woman (24 weeks) with cellulitis. Safe antibiotic options?

Exercise 16: Necrotizing Fasciitis

Patient with rapidly spreading cellulitis, severe pain, systemic toxicity. Management approach?

Exercise 17: Water Exposure

Patient develops cellulitis after fishing in Gulf Coast waters. Special pathogen considerations?

Exercise 18: Recurrent Cellulitis

Patient with 4th episode of leg cellulitis this year. Additional evaluation needed?

Exercise 19: Oral to IV Transition

Hospitalized patient improving on IV vancomycin. Criteria for switching to oral antibiotics?

Exercise 20: Prevention Counseling

Patient recovering from cellulitis asks about prevention. Key recommendations?

Clinical Pearl: Purulent = think MRSA, non-purulent = think Streptococcus. Abscesses >5cm or with significant surrounding cellulitis benefit from antibiotics post-drainage. For MRSA coverage, choose based on local resistance patterns: clindamycin (if <20% inducible resistance), TMP-SMX, or doxycycline for outpatients.

Diabetic Ulcers

Diabetic foot ulcers are complex wounds with high infection risk due to neuropathy, vascular compromise, and hyperglycemia-induced immune dysfunction. Infections are typically polymicrobial, involving gram-positive cocci, gram-negative bacilli, and anaerobes, requiring broad-spectrum coverage. Treatment duration depends on infection severity, with mild infections requiring 1-2 weeks and severe/osteomyelitis cases needing 4-6 weeks or longer.

Common Pathogens

- Mild infections: Staphylococcus aureus (MSSA/MRSA), Streptococcus spp., Enterococcus spp.

- Moderate-severe infections: Polymicrobial with gram-negatives and anaerobes
- Gram-negative bacilli: Escherichia coli, Klebsiella pneumoniae, Enterobacter spp., Proteus mirabilis
- Pseudomonas risk: Previous antibiotics, chronic wounds, healthcare exposure
- Anaerobes: Bacteroides spp., Prevotella spp., Peptostreptococcus spp., Clostridium spp.
- MRSA risk factors: Previous MRSA, healthcare exposure, severe infections, treatment failure

Antibiotic Choices

1. Mild Infection (No Systemic Symptoms)

First-line:

- Amoxicillin-clavulanate 875/125mg PO BID × 1-2 weeks
- Clindamycin 450mg PO TID × 1-2 weeks

2. Moderate Infection (Systemic Symptoms)

First-line:

- Ampicillin-sulbactam 3g IV Q6H × 1-2 weeks
- Ertapenem 1g IV daily × 1-2 weeks

3. Severe Infection/MRSA Risk

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H + piperacillin-tazobactam 4.5g IV Q6H
- Linezolid 600mg IV/PO BID + ertapenem 1g IV daily

4. Osteomyelitis

First-line:

- Vancomycin + piperacillin-tazobactam × 4-6 weeks
- Culture-guided therapy based on bone biopsy

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Adult Frequency
Vancomycin	15-20mg/kg	10-15mg/kg	Q8-12H
Piperacillin-tazobactam	4.5g	3.375g if CrCl <40	Q6H
Ertapenem	1g	500mg if CrCl <30	Daily
Ampicillin-sulbactam	3g	1.5-3g	Q6H
Linezolid	600mg	600mg	BID

2. Oral Antibiotics

Drug	Adult Dose	Elderly Dose	Frequency
Amoxicillin-clavulanate	875/125mg	500/125mg if CrCl <30	BID
Clindamycin	450mg	300mg	TID
Linezolid	600mg	600mg	BID
Levofloxacin	750mg	500mg if CrCl <50	Daily
TMP-SMX	1-2 DS tablets	1 DS tablet	BID

3. Renal Adjustments

- Vancomycin: Dose based on levels and renal function
- Piperacillin-tazobactam: CrCl 20-40: 3.375g Q6H; CrCl <20: 2.25g Q6H
- Ertapenem: CrCl <30: 500mg daily
- Levofloxacin: CrCl 20-49: 750mg Q48H; CrCl 10-19: 500mg Q48H
- TMP-SMX: CrCl <30: Reduce dose 50%

Organism Coverage

- Amoxicillin-clavulanate: Staphylococcus, Streptococcus, Enterococcus, anaerobes, some gram-negatives
- Vancomycin: MRSA, MSSA, Streptococcus, Enterococcus (vancomycin-sensitive)
- Piperacillin-tazobactam: Broad gram-negative, Pseudomonas, anaerobes, some gram-positives
- Ertapenem: Broad spectrum excluding Pseudomonas, MRSA, Enterococcus
- Linezolid: MRSA, VRE, Streptococcus, no gram-negative coverage

Contraindications

- Amoxicillin-clavulanate: Penicillin allergy, previous cholestatic jaundice
- Vancomycin: Hypersensitivity, previous "red man syndrome"
- Linezolid: MAO inhibitor use, uncontrolled hypertension, pheochromocytoma
- Levofloxacin: Pregnancy, myasthenia gravis, tendon disorders

- TMP-SMX: Sulfa allergy, severe renal impairment, pregnancy (third trimester)

Adverse Effects

- Amoxicillin-clavulanate: Diarrhea, C. difficile, hepatotoxicity
- Vancomycin: "Red man syndrome," nephrotoxicity, ototoxicity
- Piperacillin-tazobactam: C. difficile, allergic reactions, electrolyte abnormalities
- Linezolid: Thrombocytopenia, peripheral neuropathy, optic neuropathy
- Ertapenem: C. difficile, CNS effects, allergic reactions

Drug Interactions

- Amoxicillin-clavulanate: Warfarin (↑INR), allopurinol (↑rash risk)
- Vancomycin: Aminoglycosides (↑nephrotoxicity), loop diuretics
- Linezolid: Serotonergic drugs (serotonin syndrome), tyramine-rich foods
- Levofloxacin: Warfarin (↑INR), antacids (↓absorption)
- Piperacillin-tazobactam: Warfarin (↑INR), vecuronium (↑paralysis)

Treatment Duration

- Mild infection: 1-2 weeks
- Moderate infection: 2-3 weeks
- Severe infection: 3-4 weeks
- Osteomyelitis: 4-6 weeks minimum (up to 12 weeks for chronic)

- Post-amputation: 3-5 days if margins clean
- Extend treatment if slow healing or immunocompromised
- Culture-negative infections: Treat based on clinical severity

PRACTICAL EXERCISES

Exercise 1: Mild Diabetic Foot Infection

65-year-old diabetic with small ulcer, mild erythema, no systemic symptoms. Outpatient treatment?

Exercise 2: Moderate Infection

58-year-old diabetic with foot ulcer, tracking erythema, low-grade fever. Hospitalization needed?

Exercise 3: Severe Infection

72-year-old diabetic with extensive foot infection, fever 102°F, leukocytosis. Empiric antibiotic choice?

Exercise 4: MRSA Risk Assessment

Nursing home diabetic with recurrent foot infections, previous MRSA. Antibiotic selection?

Exercise 5: Osteomyelitis Suspicion

Diabetic patient with chronic ulcer, exposed bone, elevated ESR/CRP. Treatment approach?

Exercise 6: Culture Results

Foot infection culture shows E. coli and Bacteroides. Current ampicillin-sulbactam appropriate?

Exercise 7: Renal Impairment

Diabetic patient with CrCl 25 mL/min needs piperacillin-tazobactam. Dosing adjustment?

Exercise 8: Treatment Duration

Patient with moderate diabetic foot infection improving after 2 weeks IV therapy. Continue treatment?

Exercise 9: Step-Down Therapy

Hospitalized patient improving on IV vancomycin + piperacillin-tazobactam. Oral options?

Exercise 10: Treatment Failure

Patient on amoxicillin-clavulanate for 1 week, worsening infection. Next steps?

Exercise 11: Drug Interaction

Diabetic on warfarin develops foot infection, prescribed levofloxacin. Monitoring needed?

Exercise 12: Chronic Osteomyelitis

Patient with chronic diabetic foot osteomyelitis, multiple failed treatments. Management strategy?

Exercise 13: Post-Amputation

Diabetic underwent toe amputation for osteomyelitis, clean margins. Antibiotic duration?

Exercise 14: Pseudomonas Risk

Diabetic with chronic ulcer, previous multiple antibiotic courses. Pathogen considerations?

Exercise 15: Elderly Patient

85-year-old diabetic with foot infection, CrCl 40 mL/min. Antibiotic choice and dosing?

Exercise 16: Vancomycin Levels

Patient on vancomycin for diabetic foot infection, trough level 8 mcg/mL. Adjustment needed?

Exercise 17: Prevention Discussion

Diabetic patient recovered from foot infection asks about prevention. Key strategies?

Exercise 18: Allergic Reaction

Patient develops rash on day 3 of amoxicillin-clavulanate. Alternative antibiotics?

Exercise 19: Polymicrobial Infection

Culture shows MRSA, E. coli, and anaerobes. Optimal antibiotic combination?

Exercise 20: Glucose Control

Patient with foot infection has persistent hyperglycemia despite antibiotics. Impact on treatment?

Clinical Pearl: Diabetic foot infections are almost always polymicrobial. Start broad-spectrum therapy and narrow based on cultures. For osteomyelitis, get bone biopsy for definitive diagnosis and plan 4-6 weeks of treatment. Remember: good glucose control is as important as antibiotics for healing.

Felon

A felon is a closed-space infection of the fingertip pulp involving the fibrous septa, causing intense throbbing pain and swelling. Early felons may respond to oral antibiotics alone, but established infections require surgical drainage due to compartment-like anatomy that can lead to osteomyelitis or digital necrosis. Prompt recognition and treatment are essential to prevent complications and preserve finger function.

Common Pathogens

- Most common: Staphylococcus aureus (MSSA and MRSA)
- Secondary pathogens: Streptococcus pyogenes, Streptococcus agalactiae
- Healthcare-associated: Methicillin-resistant Staphylococcus aureus (MRSA)
- Chronic/immunocompromised: Pseudomonas aeruginosa, Enterobacteriaceae
- Rare pathogens: Eikenella corrodens (human bite), anaerobes (diabetes/immunocompromised)

Antibiotic Choices

1. Early Felon (No Fluctuance)

First-line:

- Cephalexin 500mg PO QID × 7-10 days
- Clindamycin 300-450mg PO TID × 7-10 days

2. Established Felon (Post-Drainage)

First-line:

- Clindamycin 300-450mg PO TID × 7-10 days
- Cephalexin 500mg PO QID × 7-10 days

3. MRSA Risk Factors

First-line:

- Clindamycin 300-450mg PO TID × 7-10 days
- Doxycycline 100mg PO BID × 7-10 days
- TMP-SMX 1-2 DS tablets PO BID × 7-10 days

4. Severe/Hospitalized

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H × 7-10 days
- Clindamycin 600-900mg IV Q8H × 7-10 days

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	40-60mg/kg/day divided	Q8-12H
Clindamycin	600-900mg	25-40mg/kg/day divided	Q8H
Cefazolin	1-2g	100mg/kg/day divided	Q8H
Nafcillin	2g	150-200mg/kg/day divided	Q4H
Linezolid	600mg	30mg/kg/day	BID

		divided	

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Cephalexin	500mg	50-100mg/kg/day divided	QID
Clindamycin	300-450mg	25-40mg/kg/day divided	TID
Doxycycline	100mg	Not recommended <8yr	BID
TMP-SMX	1-2 DS tablets	8-12mg/kg/day TMP	BID
Linezolid	600mg	30mg/kg/day divided	BID

3. Renal Adjustments

- Vancomycin: Adjust based on levels and renal function
- Cephalexin: CrCl <50: Reduce dose 50%
- TMP-SMX: CrCl <30: Reduce dose 50%
- Clindamycin: No adjustment needed
- Doxycycline: No adjustment needed

Organism Coverage

- Cephalexin: Staphylococcus aureus (MSSA), Streptococcus spp., no MRSA coverage

- Clindamycin: MSSA, MRSA (if susceptible), Streptococcus spp., anaerobes
- Vancomycin: MRSA, MSSA, Streptococcus spp., Enterococcus (vancomycin-sensitive)
- Doxycycline: MSSA, MRSA (if susceptible), Streptococcus spp.
- TMP-SMX: MSSA, MRSA (if susceptible), some gram-negatives

Contraindications

- Cephalexin: Penicillin/cephalosporin allergy (cross-reactivity)
- Clindamycin: Previous C. difficile colitis, severe hepatic impairment
- Vancomycin: Hypersensitivity, previous "red man syndrome"
- Doxycycline: Pregnancy, children <8 years, severe hepatic impairment
- TMP-SMX: Sulfa allergy, severe renal impairment, pregnancy (third trimester)

Adverse Effects

- Cephalexin: GI upset, allergic reactions, C. difficile (rare)
- Clindamycin: C. difficile colitis, GI upset, rash
- Vancomycin: "Red man syndrome," nephrotoxicity, ototoxicity
- Doxycycline: Photosensitivity, GI upset, esophageal irritation
- TMP-SMX: Rash, hyperkalemia, bone marrow suppression

Drug Interactions

- Cephalexin: Warfarin (↑INR), metformin (↑levels)
- Clindamycin: Neuromuscular blocking agents (↑paralysis)
- Vancomycin: Aminoglycosides (↑nephrotoxicity), loop diuretics
- Doxycycline: Antacids (↓absorption), warfarin (↑INR)
- TMP-SMX: Warfarin (↑INR), ACE inhibitors (↑hyperkalemia)

Treatment Duration

- Early felon (no drainage): 7-10 days
- Post-drainage: 7-10 days
- Complicated infection: 10-14 days
- Osteomyelitis: 4-6 weeks
- Immunocompromised: 10-14 days minimum
- Continue until resolution of erythema, swelling, and tenderness
- Extend duration if slow response or risk factors present

PRACTICAL EXERCISES

Exercise 1: Early Felon

35-year-old carpenter with 2-day history of fingertip pain and swelling, no fluctuance. Treatment approach?

Exercise 2: Established Felon

28-year-old with painful fingertip swelling and fluctuance, underwent I&D. Post-operative antibiotic choice?

Exercise 3: MRSA Risk Factors

Healthcare worker with felon, previous MRSA infection 6 months ago. Antibiotic selection?

Exercise 4: Pediatric Felon

8-year-old, 25kg child with felon requiring antibiotics. Calculate cephalexin dose.

Exercise 5: Severe Felon

45-year-old diabetic with extensive felon, tracking erythema up finger, fever. Treatment approach?

Exercise 6: Penicillin Allergy

Patient with severe penicillin allergy develops felon. Alternative antibiotic options?

Exercise 7: Treatment Duration

Patient with felon improving after 5 days of clindamycin. Continue treatment how long?

Exercise 8: Osteomyelitis Concern

Patient with chronic felon, X-ray shows possible bone involvement. Treatment modification?

Exercise 9: Treatment Failure

Patient on cephalexin for 4 days with worsening felon. Next management steps?

Exercise 10: Immunocompromised

HIV patient with CD4 150 develops felon. Treatment considerations?

Exercise 11: Drug Interaction

Patient on warfarin develops felon, prescribed TMP-SMX. Monitoring requirements?

Exercise 12: Pregnancy

32-year-old pregnant woman (28 weeks) with felon. Safe antibiotic choices?

Exercise 13: Renal Impairment

Patient with CrCl 20 mL/min needs antibiotics for felon. Dosing adjustments needed?

Exercise 14: Culture Results

Felon culture shows MRSA sensitive to clindamycin. Continue current therapy?

Exercise 15: Drainage Complications

Post-drainage felon with persistent pain and swelling after 1 week of antibiotics. Evaluation?

Exercise 16: Recurrent Felon

Patient with second felon in 3 months, same finger. Additional considerations?

Exercise 17: Occupational Exposure

Veterinarian develops felon after animal bite. Pathogen considerations?

Exercise 18: Step-Down Therapy

Hospitalized patient improving on IV vancomycin for severe felon. Oral transition options?

Exercise 19: Pain Management

Patient post-felon drainage experiencing significant pain despite antibiotics. Pain control strategies?

Exercise 20: Prevention Counseling

Manual laborer asks about preventing future felons. Key prevention strategies?

Clinical Pearl: Felons require drainage once fluctuance develops - antibiotics alone are insufficient for established infections. Always suspect MRSA in healthcare workers, recurrent infections, or treatment failures. Early recognition and prompt drainage prevent osteomyelitis and preserve finger function.

SECTION III: SPECIAL SITUATIONS & POPULATIONS

This section addresses antibiotic management in complex clinical scenarios and vulnerable patient populations that require specialized considerations beyond standard infectious disease protocols. These situations demand modified approaches due to altered pharmacokinetics, increased infection risks, drug interactions, or safety concerns that can significantly impact treatment outcomes.

Special populations covered include pregnant and lactating women, pediatric patients, elderly adults, and immunocompromised hosts—each presenting unique physiological considerations that influence drug selection, dosing, and monitoring. **Complex clinical situations** encompass surgical prophylaxis, intensive care unit infections, organ transplant recipients, and patients with multiple comorbidities where standard antibiotic protocols may not apply.

Understanding these nuances is critical for clinicians who must balance efficacy with safety while navigating the intricate interplay between host factors, pathogen characteristics, and antimicrobial pharmacology. Each chapter provides evidence-based guidance, practical dosing adjustments, and clinical pearls specifically tailored to optimize outcomes in these challenging scenarios.

Key Focus Areas:

- Physiologic changes affecting drug disposition and safety
- Age-specific pathogen considerations and resistance patterns
- Drug interaction management in polypharmacy patients
- Risk-benefit analysis in vulnerable populations
- Modified treatment durations and monitoring parameters
- Prevention strategies tailored to high-risk groups

This section bridges the gap between textbook knowledge and real-world clinical practice, providing the nuanced decision-making framework essential for managing antibiotics in today's complex healthcare environment.

CHAPTER 12: BIOTERRORISM AGENTS

Anthrax

Anthrax is caused by Bacillus anthracis, a gram-positive, spore-forming bacterium that presents in cutaneous, inhalational, or gastrointestinal forms depending on exposure route. Inhalational anthrax is the most lethal form and constitutes a bioterrorism concern, requiring immediate treatment with combination antibiotic therapy. Early recognition and prompt treatment are critical, as delayed therapy significantly increases mortality, particularly in systemic forms.

Common Pathogens

- Bacillus anthracis: Gram-positive, spore-forming, aerobic rod
- Naturally occurring strains: Generally susceptible to penicillin and most antibiotics
- Bioengineered strains: May have engineered resistance to penicillin and other antibiotics
- Spore form: Extremely resistant to environmental conditions, heat, and radiation
- Vegetative form: Susceptible to standard disinfection and most antibiotics

Antibiotic Choices

1. Cutaneous Anthrax (Naturally Occurring)

First-line:

- Doxycycline 100mg PO BID × 7-10 days
- Ciprofloxacin 500mg PO BID × 7-10 days

2. Inhalational/Systemic Anthrax

First-line combination:

- Ciprofloxacin 400mg IV Q8H + clindamycin 900mg IV Q8H
- Doxycycline 100mg IV Q12H + ciprofloxacin 400mg IV Q8H

3. Bioterrorism/Unknown Susceptibility

First-line combination:

- Ciprofloxacin 400mg IV Q8H + clindamycin 900mg IV Q8H + rifampin 600mg IV/PO daily
- Three-drug regimen until susceptibilities known

3. Post-Exposure Prophylaxis

First-line:

- Ciprofloxacin 500mg PO BID × 60 days
- Doxycycline 100mg PO BID × 60 days

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Ciprofloxacin	400mg	10-15mg/kg (max 400mg)	Q8H

Doxycycline	100mg	2.2mg/kg (max 100mg)	Q12H
Clindamycin	900mg	10-13mg/kg (max 900mg)	Q8H
Penicillin G	4 million units	250,000-400,000 units/kg/day	Q4H
Rifampin	600mg |	10-20mg/kg (max 600mg)	Daily

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Ciprofloxacin	500mg	10-15mg/kg (max 500mg)	BID
Doxycycline	100mg	2.2mg/kg (max 100mg)	BID
Clindamycin	450mg	10-25mg/kg/day divided	TID
Amoxicillin	875mg	45mg/kg/day divided	TID
Rifampin	600mg	10-20mg/kg (max 600mg)	Daily

3. Renal Adjustments

- Ciprofloxacin: CrCl 30-50: 400mg Q12H IV; CrCl <30: 400mg Q24H IV
- Doxycycline: No adjustment needed

- Clindamycin: No adjustment needed
- Penicillin G: CrCl <50: Reduce dose 25-50%
- Rifampin: No adjustment needed

Organism Coverage

- Ciprofloxacin: B. anthracis (including most bioengineered strains), broad gram-negative coverage
- Doxycycline: B. anthracis, broad spectrum including atypicals
- Clindamycin: B. anthracis, gram-positives, anaerobes, reduces toxin production
- Penicillin G: Natural B. anthracis strains (avoid if bioterrorism suspected)
- Rifampin: B. anthracis, excellent tissue penetration, mycobacteria

Contraindications

- Ciprofloxacin: Hypersensitivity, concurrent tizanidine use
- Doxycycline: Pregnancy, children <8 years (relative in anthrax due to severity)
- Clindamycin: Previous C. difficile colitis, severe hepatic impairment
- Penicillin G: Penicillin allergy, suspected bioengineered strains
- Note: In life-threatening anthrax, relative contraindications may be overridden

Adverse Effects

- Ciprofloxacin: Tendon rupture, QT prolongation, CNS effects, phototoxicity
- Doxycycline: Photosensitivity, GI upset, tooth discoloration (children)
- Clindamycin: C. difficile colitis, GI upset, rash
- Penicillin G: Allergic reactions, CNS toxicity (high doses), electrolyte imbalance
- Rifampin: Hepatotoxicity, orange discoloration, drug interactions

Drug Interactions

- Ciprofloxacin: Warfarin (↑INR), theophylline (↑levels), antacids (↓absorption)
- Doxycycline: Antacids (↓absorption), warfarin (↑INR), isotretinoin
- Clindamycin: Neuromuscular blocking agents (↑paralysis)
- Rifampin: CYP450 inducer (↓levels many drugs), warfarin, oral contraceptives
- Penicillin G: Warfarin (↑INR), methotrexate (↑toxicity)

Treatment Duration

- Cutaneous anthrax: 7-10 days (naturally occurring), 60 days (bioterrorism)
- Inhalational anthrax: 60 days total (IV × 14-21 days, then oral)
- Gastrointestinal anthrax: 60 days total
- Post-exposure prophylaxis: 60 days
- Meningitis: 60 days minimum

- Switch IV to oral when clinically stable (usually 14-21 days for systemic)
- Continue until clinical cure and completion of recommended duration

PRACTICAL EXERCISES

Exercise 1: Cutaneous Anthrax

45-year-old farmer with painless black eschar on forearm after handling sheep. Diagnosis suspected anthrax. Treatment?

Exercise 2: Inhalational Anthrax

55-year-old postal worker with fever, dyspnea, widened mediastinum on CXR during bioterror investigation. Emergency treatment?

Exercise 3: Post-Exposure Prophylaxis

Healthcare worker potentially exposed to aerosolized anthrax spores in laboratory accident. Prophylaxis regimen?

Exercise 4: Pediatric Dosing

30kg, 10-year-old child needs anthrax treatment. Calculate ciprofloxacin dose for systemic disease.

Exercise 5: Pregnancy Exposure

28-year-old pregnant woman (22 weeks) with potential anthrax exposure. Safe prophylaxis options?

Exercise 6: Meningitis Suspicion

Patient with confirmed inhalational anthrax develops altered mental status. Treatment modification?

Exercise 7: Treatment Duration

Patient with cutaneous anthrax feeling well after 10 days of ciprofloxacin. Continue treatment?

Exercise 8: Drug Allergy

Patient with confirmed anthrax has severe fluoroquinolone allergy. Alternative treatment options?

Exercise 9: Renal Impairment

Patient with CrCl 20 mL/min needs ciprofloxacin for anthrax. Dosing adjustment?

Exercise 10: Combination Therapy

Why is combination antibiotic therapy recommended for inhalational anthrax?

Exercise 11: Bioterrorism Response

Mass casualty event with suspected anthrax exposure. Triage and treatment approach?

Exercise 12: Treatment Failure

Patient with inhalational anthrax not improving after 48 hours of IV antibiotics. Next steps?

Exercise 13: Step-Down Therapy

Patient with inhalational anthrax clinically stable after 5 days IV therapy. Oral transition?

Exercise 14: Drug Interaction

Patient on warfarin needs ciprofloxacin for anthrax prophylaxis. Monitoring plan?

Exercise 15: Gastrointestinal Anthrax

Rare case of GI anthrax with abdominal pain, bloody diarrhea. Treatment approach?

Exercise 16: Occupational Exposure

Veterinarian working with infected livestock develops suspicious skin lesion. Management?

Exercise 17: Laboratory Diagnosis

Suspected anthrax case. Key diagnostic tests and infection control measures?

Exercise 18: Adverse Effects

Patient on doxycycline for anthrax prophylaxis develops severe photosensitivity. Management?

Exercise 19: Vaccine Considerations

Patient completing anthrax treatment asks about vaccination. Recommendations?

Exercise 20: Public Health Response

Confirmed anthrax case identified. Public health notification and contact tracing requirements?

Clinical Pearl: Always treat anthrax for 60 days regardless of clinical improvement - this duration is based on spore germination biology, not symptom resolution. For inhalational anthrax, combination therapy is essential: a fluoroquinolone plus a protein synthesis inhibitor (clindamycin or linezolid) to reduce toxin production.

Botulism

Botulism is a paralytic illness caused by botulinum toxin from Clostridium botulinum, presenting with descending flaccid paralysis, cranial nerve palsies, and autonomic dysfunction. Treatment is primarily supportive care and

antitoxin administration, as antibiotics are generally not indicated except for wound botulism or infant botulism complications. Antibiotics may actually worsen toxin release in foodborne botulism and should be avoided unless secondary bacterial infection is suspected.

Common Pathogens

- Clostridium botulinum: Gram-positive, spore-forming, anaerobic bacterium producing botulinum toxin
- Toxin types: Types A, B, E most common in human disease; Type A most severe
- Foodborne botulism: Preformed toxin in improperly preserved foods (canned goods, honey)
- Wound botulism: Active bacterial infection producing toxin in contaminated wounds
- Infant botulism: Spore ingestion with in-vivo toxin production in infant gut
- Secondary infections: Staphylococcus aureus, Streptococcus spp., gram-negative bacilli

Antibiotic Choices

1. Foodborne/Inhalational Botulism

Treatment:

- No antibiotics indicated (may increase toxin release)
- Supportive care and antitoxin (HBAT or BIG-IV)

2. Wound Botulism

First-line:

- Penicillin G 4 million units IV Q4H × 7-10 days
- Metronidazole 500mg IV Q8H × 7-10 days

3. Infant Botulism Complications

If secondary infection:

- Ampicillin 200mg/kg/day IV divided Q6H × 7-10 days
- Avoid aminoglycosides (may worsen paralysis)

4. Secondary Infections (Pneumonia/UTI)

Targeted therapy:

- Culture-guided antibiotics based on isolated organisms
- Avoid neuromuscular blocking antibiotics

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Penicillin G	4 million units	250,000-400,000 units/kg/day	Q4H
Metronidazole	500mg	30mg/kg/day divided	Q8H
Ampicillin	2g	200mg/kg/day divided	Q6H
Vancomycin	15-20mg/kg	40-60mg/kg/day divided	Q8-12H
Ceftriaxone	2g	100mg/kg/day	Daily

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Amoxicillin	875mg	45mg/kg/day divided	BID
Metronidazole	500mg	30mg/kg/day divided	TID
Clindamycin	450mg	25-40mg/kg/day divided	TID
Doxycycline	100mg	Not recommended	BID

		<8yr	
Ciprofloxacin	500mg	30mg/kg/day divided	BID

3. Renal Adjustments

- Penicillin G: CrCl <50: Reduce dose 25-50%
- Metronidazole: No adjustment needed for mild-moderate impairment
- Vancomycin: Adjust based on levels and renal function
- Ceftriaxone: No adjustment unless severe impairment
- Ciprofloxacin: CrCl <30: Reduce dose 50%

Organism Coverage

- Penicillin G: Clostridium spp., anaerobes, gram-positive cocci
- Metronidazole: Excellent anaerobic coverage including Clostridium spp.
- Ampicillin: Enterococcus, Listeria, gram-positive cocci
- Vancomycin: MRSA, Enterococcus, gram-positive cocci
- Ceftriaxone: Broad gram-negative and gram-positive coverage

Contraindications

- Penicillin G: Penicillin allergy
- Metronidazole: First trimester pregnancy, alcohol use (disulfiram reaction)
- Ampicillin: Penicillin allergy, infectious mononucleosis
- Aminoglycosides: Avoid in botulism (worsen neuromuscular blockade)
- Clindamycin: Previous C. difficile colitis

Adverse Effects

- Penicillin G: Allergic reactions, C. difficile, electrolyte imbalances
- Metronidazole: Metallic taste, peripheral neuropathy, disulfiram reaction
- Ampicillin: Rash, diarrhea, C. difficile
- Vancomycin: "Red man syndrome," nephrotoxicity, ototoxicity
- Ceftriaxone: C. difficile, biliary sludging, allergic reactions

Drug Interactions

- Penicillin G: Warfarin (↑INR), methotrexate (↑toxicity)
- Metronidazole: Warfarin (↑INR), alcohol (disulfiram reaction), lithium
- Ampicillin: Allopurinol (↑rash risk), oral contraceptives (↓effectiveness)
- Vancomycin: Aminoglycosides (↑nephrotoxicity), loop diuretics
- Avoid neuromuscular blocking drugs: May worsen paralysis

Treatment Duration

- Foodborne botulism: No antibiotics needed
- Wound botulism: 7-10 days after debridement
- Infant botulism: Generally no antibiotics unless complications
- Secondary infections: 7-14 days based on infection type
- Pneumonia: 7-10 days

- Duration based on clinical response and source control
- Avoid prolonged courses that may select resistant organisms

PRACTICAL EXERCISES

Exercise 1: Foodborne Botulism

45-year-old with descending paralysis after eating home-canned vegetables. Diplopia, dysarthria, flaccid paralysis. Antibiotic treatment?

Exercise 2: Wound Botulism

35-year-old IV drug user with infected injection site and progressive weakness. Suspected wound botulism. Treatment approach?

Exercise 3: Infant Botulism

6-month-old with constipation, weak cry, poor feeding, floppy baby syndrome. Honey exposure history. Management?

Exercise 4: Secondary Pneumonia

Botulism patient on mechanical ventilation develops pneumonia. Culture shows S. aureus. Antibiotic choice?

Exercise 5: Differential Diagnosis

Patient with acute paralysis. When to suspect botulism vs other causes? Key distinguishing features?

Exercise 6: Antitoxin Administration

Confirmed foodborne botulism case. When and how to administer botulism antitoxin?

Exercise 7: Antibiotic Contraindications

Botulism patient develops UTI. Which antibiotics to avoid and why?

Exercise 8: Pediatric Wound Botulism

12-year-old, 40kg with wound botulism from contaminated laceration. Calculate appropriate antibiotic dose.

Exercise 9: Treatment Duration

Patient with wound botulism improving after 5 days of antibiotics. Continue treatment how long?

Exercise 10: Drug Interactions

Botulism patient on metronidazole asks about alcohol-containing mouthwash. Counseling?

Exercise 11: Respiratory Failure

Botulism patient requires intubation. Avoid which medications during intubation?

Exercise 12: Bioterrorism Scenario

Multiple patients with descending paralysis after suspicious exposure. Mass casualty approach?

Exercise 13: Pregnancy

28-year-old pregnant woman (30 weeks) with wound botulism. Safe antibiotic options?

Exercise 14: Treatment Failure

Wound botulism patient not improving on penicillin after 7 days. Next steps?

Exercise 15: Prevention Counseling

Family member of botulism patient asks about prevention. Key recommendations?

Exercise 16: Laboratory Diagnosis

Suspected botulism case. Which specimens to collect and when?

Exercise 17: Supportive Care

Botulism patient with respiratory paralysis. Key supportive care measures?

Exercise 18: Recovery Phase

Botulism patient beginning to recover after 3 weeks. Expected timeline and complications?

Exercise 19: Public Health Response

Confirmed botulism case. Reporting requirements and investigation steps?

Exercise 20: Home Canning Safety

Patient recovered from botulism asks about safe food preservation. Education points?

Clinical Pearl: Remember the "4 D's" of botulism: Descending paralysis, Diplopia, Dysarthria, Dysphagia. Never use antibiotics for foodborne botulism (may worsen toxin release), but wound botulism requires both surgical debridement AND antibiotics. Always avoid aminoglycosides in botulism patients as they worsen neuromuscular blockade.

Smallpox

Smallpox is a highly contagious viral disease caused by variola virus, declared eradicated globally in 1980 but retained as a bioterrorism concern. The disease is characterized by fever, malaise, and a distinctive centrifugal

vesicular rash progressing through stages. Treatment is primarily supportive care with antivirals (tecovirimat) for severe cases, while antibiotics are reserved for secondary bacterial infections of skin lesions or systemic complications.

Common Pathogens

- Variola virus: DNA poxvirus causing smallpox (variola major and variola minor)
- Secondary bacterial infections: Staphylococcus aureus, Streptococcus pyogenes, Streptococcus pneumoniae
- Skin superinfections: MRSA, Pseudomonas aeruginosa in severe cases
- Pneumonia pathogens: S. pneumoniae, S. aureus, Haemophilus influenzae
- Sepsis organisms: Staphylococcus aureus, gram-negative enteric bacteria
- No direct antiviral antibiotics: Smallpox is viral; antibiotics only for complications

Antibiotic Choices

1. Primary Smallpox (Uncomplicated)

Treatment:

- No antibiotics indicated for uncomplicated viral illness
- Supportive care and tecovirimat (TPOXX) if available

2. Secondary Skin Infections

First-line:

- Clindamycin 300-450mg PO TID × 7-10 days
- Cephalexin 500mg PO QID × 7-10 days

3. Severe Secondary Infections/Sepsis

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H + piperacillin-tazobactam 4.5g IV Q6H
- Linezolid 600mg IV/PO BID + cefepime 2g IV Q8H

4. Pneumonia Complication

First-line:

- Vancomycin 15-20mg/kg IV Q8-12H + ceftriaxone 2g IV daily
- Linezolid 600mg IV BID + levofloxacin 750mg IV daily

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	40-60mg/kg/day divided	Q8-12H
Piperacillin-tazobactam	4.5g	300mg/kg/day divided	Q6H
Linezolid	600mg	30mg/kg/day divided	BID
Ceftriaxone	2g	100mg/kg/day	Daily
Cefepime	2g	150mg/kg/day divided	Q8H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Clindamycin	300-450mg	25-40mg/kg/day divided	TID
Cephalexin	500mg	50-100mg/kg/day divided	QID
Linezolid	600mg	30mg/kg/day divided	BID
Levofloxacin	750mg	Not recommended	Daily

		<18yr	
Doxycycline	100mg	Not recommended <18yr	BID

3. Renal Adjustments

- Vancomycin: Adjust based on levels and renal function
- Piperacillin-tazobactam: CrCl 20-40: 3.375g Q6H; CrCl <20: 2.25g Q6H
- Ceftriaxone: No adjustment unless severe impairment
- Levofloxacin: CrCl 20-49: 750mg Q48H
- Linezolid: No adjustment needed

Organism Coverage

- Vancomycin: MRSA, MSSA, Streptococcus spp., Enterococcus (vancomycin-sensitive)
- Clindamycin: MSSA, MRSA (if susceptible), Streptococcus spp., anaerobes
- Piperacillin-tazobactam: Broad gram-negative, Pseudomonas, anaerobes, some gram-positives
- Linezolid: MRSA, VRE, Streptococcus spp., good skin/soft tissue penetration
- Ceftriaxone: S. pneumoniae, H. influenzae, many gram-negatives

Contraindications

- Vancomycin: Hypersensitivity, previous "red man syndrome"
- Clindamycin: Previous C. difficile colitis, severe hepatic impairment

- Linezolid: MAO inhibitor use, uncontrolled hypertension, pheochromocytoma
- Levofloxacin: Pregnancy, myasthenia gravis, tendon disorders
- Piperacillin-tazobactam: Penicillin allergy

Adverse Effects

- Vancomycin: "Red man syndrome," nephrotoxicity, ototoxicity
- Clindamycin: C. difficile colitis, GI upset, rash
- Linezolid: Thrombocytopenia, peripheral neuropathy, optic neuropathy
- Piperacillin-tazobactam: C. difficile, allergic reactions, electrolyte abnormalities
- Ceftriaxone: C. difficile, biliary sludging, allergic reactions

Drug Interactions

- Vancomycin: Aminoglycosides (↑nephrotoxicity), loop diuretics (↑ototoxicity)
- Clindamycin: Neuromuscular blocking agents (↑paralysis)
- Linezolid: Serotonergic drugs (serotonin syndrome), tyramine-rich foods
- Levofloxacin: Warfarin (↑INR), antacids (↓absorption)
- Piperacillin-tazobactam: Warfarin (↑INR), vecuronium (↑paralysis)

Treatment Duration

- Uncomplicated smallpox: No antibiotics needed (supportive care only)

- Secondary skin infections: 7-10 days
- Pneumonia: 7-14 days depending on severity
- Sepsis/bacteremia: 10-14 days minimum
- Complicated infections: 14-21 days
- Duration based on clinical response and complications
- Continue until resolution of fever and improvement in infection markers

PRACTICAL EXERCISES

Exercise 1: Suspected Smallpox Case

35-year-old with fever, headache, and vesicular rash in centrifugal distribution. Suspected smallpox. Initial treatment approach?

Exercise 2: Secondary Skin Infection

Smallpox patient develops purulent, crusted lesions with surrounding erythema. Culture pending. Antibiotic choice?

Exercise 3: Bioterrorism Response

Multiple patients presenting with smallpox-like illness after suspicious exposure. Mass casualty management?

Exercise 4: Pediatric Case

8-year-old, 25kg child with confirmed smallpox develops secondary bacterial skin infection. Antibiotic dosing?

Exercise 5: Severe Complications

Smallpox patient develops high fever, hypotension, altered mental status. Suspected sepsis. Treatment?

Exercise 6: Differential Diagnosis

Patient with generalized vesicular rash. How to distinguish smallpox from chickenpox?

Exercise 7: Pneumonia Complication

Smallpox patient on day 10 develops dyspnea, productive cough, infiltrates on CXR. Management?

Exercise 8: Pregnancy

28-year-old pregnant woman (24 weeks) exposed to smallpox develops secondary skin infection. Safe antibiotics?

Exercise 9: Immunocompromised

HIV patient with CD4 50 develops smallpox with extensive lesions. Treatment modifications?

Exercise 10: Treatment Duration

Patient with smallpox skin superinfection improving after 7 days of clindamycin. Continue treatment?

Exercise 11: Antiviral Therapy

Severe smallpox case. When is tecovirimat (TPOXX) indicated and how does it interact with antibiotics?

Exercise 12: Isolation Precautions

Confirmed smallpox case. What isolation measures and staff protection needed?

Exercise 13: Vaccine Considerations

Healthcare worker exposed to smallpox patient. Post-exposure vaccination and antibiotic prophylaxis?

Exercise 14: Drug Resistance

Smallpox patient's skin infection culture shows MRSA. Current clindamycin therapy appropriate?

Exercise 15: Renal Impairment

Smallpox patient with sepsis and CrCl 25 mL/min needs vancomycin. Dosing approach?

Exercise 16: Treatment Failure

Patient on antibiotics for smallpox skin infection worsening after 5 days. Next steps?

Exercise 17: Public Health Response

Confirmed smallpox case identified. Immediate public health actions required?

Exercise 18: Laboratory Diagnosis

Suspected smallpox case. Key diagnostic tests and specimen collection?

Exercise 19: Contact Tracing

Smallpox patient had multiple contacts before diagnosis. Contact management strategy?

Exercise 20: Long-term Complications

Smallpox survivor with chronic skin changes asks about ongoing infection risk. Counseling?

Clinical Pearl: Smallpox is a viral disease - antibiotics are ONLY for secondary bacterial infections, not primary treatment. The key distinguishing feature from chickenpox is the centrifugal rash distribution (face and extremities first) with all lesions in the same stage of development. Remember: isolate first, treat complications second.

CHAPTER 13: OCCUPATIONAL POST-EXPOSURE PROPHYLAXIS

HIV and Hepatitis

HIV and hepatitis infections significantly alter immune function and drug metabolism, requiring modified antibiotic approaches for opportunistic infections and bacterial complications. Patients with advanced HIV (CD4 <200) are susceptible to unusual pathogens requiring broader spectrum and prolonged treatment courses. Hepatitis patients, particularly those with cirrhosis, require dose adjustments for hepatically metabolized antibiotics and careful monitoring for drug-induced liver injury.

Common Pathogens

- HIV-related opportunistic infections: Pneumocystis jirovecii, Mycobacterium avium complex (MAC), Toxoplasma gondii
- Advanced HIV bacterial infections: Streptococcus pneumoniae, Staphylococcus aureus, Salmonella spp., Mycobacterium tuberculosis
- Hepatitis-related infections: Spontaneous bacterial peritonitis (E. coli, Klebsiella, Enterococcus)
- Skin/soft tissue (HIV): MRSA, Pseudomonas aeruginosa, atypical mycobacteria
- Respiratory (HIV): Streptococcus pneumoniae, Haemophilus influenzae, Pseudomonas aeruginosa
- CNS infections (HIV): Cryptococcus neoformans, Toxoplasma gondii, JC virus

Antibiotic Choices

1. Pneumocystis Pneumonia (PCP)

First-line:

- TMP-SMX 15-20mg/kg/day TMP IV/PO divided TID × 21 days
- Prednisone 40mg BID × 5 days, then taper

2. Mycobacterium Avium Complex (MAC)

First-line:

- Azithromycin 500mg PO daily + ethambutol 15mg/kg PO daily
- Rifabutin 300mg PO daily (if no drug interactions)

3. Spontaneous Bacterial Peritonitis

First-line:

- Ceftriaxone 2g IV daily × 5 days
- Albumin 1.5g/kg day 1, then 1g/kg day 3

4. HIV-Associated Pneumonia

First-line:

- Ceftriaxone 2g IV daily + azithromycin 500mg IV daily
- Levofloxacin 750mg IV daily (if no interaction concerns)

Standard Dosing

1. IV Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
TMP-SMX	15-20mg/kg/day TMP	15-20mg/kg/day TMP	Reduce dose 50% if severe
Ceftriaxone	2g	100mg/kg/day	No adjustment needed
Azithromycin	500mg	10mg/kg	Use with caution
Vancomycin	15-20mg/kg	40-60mg/kg/day	No adjustment needed
Amphotericin B	0.7-1mg/kg	0.7-1mg/kg	Reduce dose if severe

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
TMP-SMX	1-2 DS tablets	8-12mg/kg/day TMP	Reduce dose 50% if severe
Azithromycin	500mg	10mg/kg day 1, then 5mg/kg	Use with caution
Ethambutol	15mg/kg	15-25mg/kg	No adjustment needed
Rifabutin	300mg	10-20mg/kg	Reduce dose 50% if

			severe
Doxycycline	100mg	Not recommended <8yr	Use with caution

3. Renal Adjustments

- TMP-SMX: CrCl 15-30: Reduce dose 50%; CrCl <15: Avoid
- Ceftriaxone: No adjustment unless severe impairment
- Vancomycin: Dose based on levels and renal function
- Ethambutol: CrCl <50: Reduce dose 50%
- Azithromycin: No adjustment needed

Organism Coverage

- TMP-SMX: Pneumocystis jirovecii, Toxoplasma gondii, Nocardia, gram-negatives
- Azithromycin: MAC, Mycoplasma, Chlamydia, atypical pathogens
- Ceftriaxone: S. pneumoniae, H. influenzae, E. coli, Klebsiella
- Rifabutin: Mycobacteria (MAC, TB), reduced drug interactions vs rifampin
- Vancomycin: MRSA, MSSA, Enterococcus, gram-positive cocci

Contraindications

- TMP-SMX: Severe sulfa allergy, severe renal impairment, folate deficiency
- Azithromycin: Severe hepatic impairment, QT prolongation history

- Rifabutin: Hypersensitivity, concurrent protease inhibitor interactions
- Doxycycline: Pregnancy, severe hepatic impairment
- Amphotericin B: Severe renal impairment (relative contraindication)

Adverse Effects

- TMP-SMX: Hyperkalemia, rash, bone marrow suppression, hepatotoxicity
- Azithromycin: QT prolongation, hepatotoxicity, GI upset
- Rifabutin: Orange discoloration, hepatotoxicity, arthralgia, uveitis
- Vancomycin: Nephrotoxicity, ototoxicity, "red man syndrome"
- Amphotericin B: Nephrotoxicity, hypokalemia, infusion reactions

Drug Interactions

- TMP-SMX: Warfarin (↑INR), phenytoin (↑levels), ACE inhibitors (↑K+)
- Azithromycin: QT-prolonging drugs, digoxin (↑levels)
- Rifabutin: HIV protease inhibitors, efavirenz (dose adjustments needed)
- Doxycycline: Warfarin (↑INR), antacids (↓absorption)
- All antibiotics: Potential interactions with HIV medications and hepatitis drugs

Treatment Duration

- PCP: 21 days (never shorter)

- MAC treatment: Lifelong if CD4 <50, until immune reconstitution
- MAC prophylaxis: Until CD4 >100 × 6 months on ART
- Bacterial pneumonia: 7-10 days (may extend to 14 days if severe)
- SBP: 5-7 days acute treatment, then prophylaxis if recurrent
- TB in HIV: 6-9 months (extend if slow response)
- Extend all durations if CD4 <50 or poor clinical response

PRACTICAL EXERCISES

Exercise 1: PCP Diagnosis

35-year-old HIV patient, CD4 50, presents with dyspnea, dry cough, fever. CXR shows bilateral interstitial infiltrates. Treatment?

Exercise 2: MAC Prophylaxis

HIV patient with CD4 45 on stable ART. MAC prophylaxis indicated?

Exercise 3: Drug Interactions

HIV patient on atazanavir/ritonavir needs MAC treatment. Rifabutin dosing adjustment?

Exercise 4: Hepatitis B Cirrhosis

Patient with decompensated cirrhosis develops SBP. Antibiotic choice and hepatic considerations?

Exercise 5: PCP Treatment Failure

Patient with PCP not improving after 5 days of TMP-SMX. Alternative therapy?

Exercise 6: Pediatric HIV

12-year-old HIV patient, 40kg, CD4 30, needs PCP treatment. Calculate TMP-SMX dose.

Exercise 7: Sulfa Allergy

HIV patient with severe sulfa allergy develops PCP. Treatment options?

Exercise 8: Immune Reconstitution

HIV patient on ART for 8 months, CD4 increased from 30 to 150. Continue MAC prophylaxis?

Exercise 9: Hepatitis C Treatment

Patient on sofosbuvir/velpatasvir develops bacterial pneumonia. Antibiotic interactions?

Exercise 10: TMP-SMX Toxicity

Patient on PCP treatment develops hyperkalemia and rash. Management approach?

Exercise 11: HIV Pneumonia

HIV patient, CD4 200, presents with productive cough, fever, lobar infiltrate. Empiric treatment?

Exercise 12: MAC Immune Reconstitution

HIV patient developing MAC-IRIS after starting ART. Treatment modifications?

Exercise 13: Spontaneous Bacterial Peritonitis

Cirrhotic patient with ascites, fever, abdominal pain. Paracentesis shows 300 PMNs. Treatment?

Exercise 14: HIV-Associated TB

HIV patient, CD4 80, diagnosed with pulmonary TB. Treatment duration considerations?

Exercise 15: Hepatic Impairment

Patient with severe hepatitis develops infection requiring azithromycin. Dosing considerations?

Exercise 16: PCP Prophylaxis

HIV patient, CD4 180, starting chemotherapy. PCP prophylaxis needed?

Exercise 17: Rifabutin vs Rifampin

HIV patient needs TB treatment while on efavirenz. Rifampin vs rifabutin choice?

Exercise 18: Renal Impairment

HIV patient with CrCl 20 mL/min needs PCP treatment. TMP-SMX dosing?

Exercise 19: MAC Resistance

Patient with MAC infection not responding to azithromycin + ethambutol. Next steps?

Exercise 20: SBP Prophylaxis

Cirrhotic patient with prior SBP episode. Secondary prophylaxis regimen?

Exercise 21: Pregnancy Considerations

28-year-old HIV-positive pregnant woman needs PCP treatment. Safe options?

Exercise 22: CD4 Monitoring

Patient with CD4 40 on MAC prophylaxis, now CD4 120 after 6 months ART. Continue prophylaxis?

Exercise 23: Hepatitis Drug Interactions

Patient on HIV protease inhibitors develops hepatitis B flare. Treatment considerations?

Exercise 24: Toxoplasma Treatment

HIV patient, CD4 60, diagnosed with CNS toxoplasmosis. Treatment regimen?

Exercise 25: PCP Steroid Therapy

Patient with severe PCP, PaO2 65 mmHg. Steroid indication and dosing?

Exercise 26: MAC Discontinuation

Patient on MAC treatment for 12 months, CD4 now 200. When to stop treatment?

Exercise 27: Hepatic Encephalopathy

Cirrhotic patient with grade 2 encephalopathy needs antibiotics. Drug selection?

Exercise 28: HIV Esophagitis

HIV patient with odynophagia and CD4 100. Empiric treatment approach?

Exercise 29: Nocardia Infection

HIV patient with pulmonary nocardiosis. Treatment duration and monitoring?

Exercise 30: Hepatitis B Reactivation

Cancer patient with chronic hepatitis B develops bacterial infection. Hepatitis monitoring?

Exercise 31: PCP Prevention

HIV patient unable to tolerate TMP-SMX. Alternative prophylaxis options?

Exercise 32: Cryptosporidium

HIV patient, CD4 50, with chronic diarrhea. Cryptosporidium treatment?

Exercise 33: Atypical Mycobacteria

HIV patient with disseminated M. kansasii. Treatment modifications from MAC?

Exercise 34: Hepatitis C Cirrhosis

Patient with HCV cirrhosis develops cellulitis. Antibiotic choice considerations?

Exercise 35: CMV Retinitis

HIV patient with CMV retinitis needs bacterial pneumonia treatment. Drug interactions?

Exercise 36: Microsporidiosis

HIV patient with chronic diarrhea, microsporidium identified. Treatment options?

Exercise 37: Hepatorenal Syndrome

Cirrhotic patient with hepatorenal syndrome needs infection treatment. Approach?

Exercise 38: Histoplasmosis

HIV patient in endemic area with fever, weight loss. Empiric treatment?

Exercise 39: Isosporiasis

HIV patient with chronic diarrhea, Isospora belli identified. Treatment?

Exercise 40: Portal Hypertension

Patient with portal hypertension develops pneumonia. Bleeding risk considerations?

Exercise 41: HIV Nephropathy

HIV patient with nephropathy, CrCl 30, needs MAC treatment. Dosing?

Exercise 42: Cryptococcal Meningitis

HIV patient with headache, altered mental status. CSF shows cryptococcus. Treatment?

Exercise 43: Hepatitis Coinfection

HIV/HCV coinfected patient needs TB treatment. Drug selection priorities?

Exercise 44: Salmonella Bacteremia

HIV patient with recurrent Salmonella bacteremia. Treatment approach?

Exercise 45: Bartonella Infection

HIV patient with bacillary angiomatosis. Treatment regimen?

Exercise 46: Ascites Management

Large volume ascites patient develops infection. Paracentesis and treatment?

Exercise 47: JC Virus PML

HIV patient with PML, needs bacterial infection treatment. Considerations?

Exercise 48: Rhodococcus Infection

HIV patient with cavitary lung lesions, Rhodococcus isolated. Treatment?

Exercise 49: Hepatic Cytopenia

Cirrhotic patient with thrombocytopenia needs antibiotic therapy. Monitoring?

Exercise 50: Penicilliosis

HIV patient from Southeast Asia with fever, skin lesions. Treatment?

Exercise 51: Chronic Hepatitis B

Patient on tenofovir develops bacterial infection. Drug interaction concerns?

Exercise 52: HIV Cardiomyopathy

HIV patient with heart failure needs pneumonia treatment. Drug considerations?

Exercise 53: Cyclospora Infection

HIV patient with chronic diarrhea, Cyclospora identified. Treatment duration?

Exercise 54: Variceal Bleeding

Patient with recent variceal bleeding develops SBP. Treatment approach?

Exercise 55: Kaposi Sarcoma

HIV patient with KS develops secondary bacterial infection. Treatment?

Exercise 56: HAART Resistance

HIV patient with virologic failure needs opportunistic infection treatment. Approach?

Exercise 57: Hepatitis Delta

Patient with hepatitis D develops bacterial infection. Special considerations?

Exercise 58: Mycobacterium Genavense

HIV patient with disseminated M. genavense. Treatment approach?

Exercise 59: Chronic Kidney Disease

HIV patient with stage 4 CKD needs infection treatment. Drug modifications?

Exercise 60: Hepatitis E

Immunocompromised patient with chronic hepatitis E develops infection. Management?

Exercise 61: Pneumocystis Prophylaxis Failure

Patient on dapsone prophylaxis develops PCP. Treatment implications?

Exercise 62: Autoimmune Hepatitis

Patient on immunosuppression develops bacterial infection. Treatment approach?

Exercise 63: HIV Lipodystrophy

Patient with lipodystrophy develops skin infection. Treatment considerations?

Exercise 64: Transfusion-Related Hepatitis

Patient with acute hepatitis develops bacterial superinfection. Management?

Exercise 65: Atypical PCP

HIV patient with atypical PCP presentation. Diagnostic and treatment approach?

Exercise 66: Drug-Induced Hepatitis

Patient develops drug-induced hepatitis during antibiotic treatment. Management?

Exercise 67: HIV-Associated Nephropathy

Patient with HIVAN needs infection treatment. Renal dosing considerations?

Exercise 68: Alcoholic Hepatitis

Patient with severe alcoholic hepatitis develops infection. Treatment approach?

Exercise 69: Disseminated MAC

HIV patient with disseminated MAC and multiple organ involvement. Treatment?

Exercise 70: Fulminant Hepatitis

Patient with fulminant hepatitis develops secondary infection. Management priorities?

Exercise 71: HIV Peripheral Neuropathy

Patient with HIV neuropathy needs treatment causing additional neuropathy. Approach?

Exercise 72: NASH Cirrhosis

Patient with NASH cirrhosis develops pneumonia. Treatment considerations?

Exercise 73: Opportunistic Infection Prophylaxis

HIV patient, CD4 50, comprehensive prophylaxis strategy needed. Regimens?

Exercise 74: Hepatitis B Flare

Patient develops hepatitis B flare during bacterial infection treatment. Management?

Exercise 75: MAC-IRIS

Patient developing MAC immune reconstitution syndrome. Treatment modifications?

Exercise 76: Primary Biliary Cirrhosis

PBC patient develops bacterial infection. Drug metabolism considerations?

Exercise 77: HIV Cognitive Impairment

Patient with HIV-associated dementia needs complex antibiotic regimen. Approach?

Exercise 78: Hepatitis C SVR

Patient achieved HCV cure but develops infection. Previous drug considerations?

Exercise 79: Disseminated Histoplasmosis

HIV patient with disseminated histoplasmosis and bacterial superinfection. Treatment?

Exercise 80: Wilson Disease

Patient with Wilson disease and hepatic involvement develops infection. Approach?

Exercise 81: HIV Wasting Syndrome

Patient with severe wasting develops opportunistic infection. Nutritional considerations?

Exercise 82: Chronic Hepatitis D

Patient with chronic HDV develops bacterial infection. Treatment approach?

Exercise 83: Pneumocystis Recurrence

Patient with recurrent PCP episodes. Prevention and treatment strategy?

Exercise 84: Hemochromatosis

Patient with hemochromatosis develops bacterial infection. Iron considerations?

Exercise 85: HIV Elite Controller

Long-term nonprogressor with bacterial infection. Treatment modifications?

Exercise 86: Budd-Chiari Syndrome

Patient with Budd-Chiari develops bacterial infection. Anticoagulation considerations?

Exercise 87: Coccidioidomycosis

HIV patient in endemic area with disseminated cocci. Treatment approach?

Exercise 88: Hereditary Hepatitis

Patient with genetic liver disease develops infection. Metabolic considerations?

Exercise 89: HIV Nephropathy Treatment

Patient with biopsy-proven HIVAN needs infection treatment. Approach?

Exercise 90: Hepatitis Prophylaxis

Healthcare worker with hepatitis exposure needs antibiotic prophylaxis. Approach?

Exercise 91: Mycobacterium Xenopi

HIV patient with M. xenopi infection. Treatment approach?

Exercise 92: Veno-Occlusive Disease

Patient with hepatic VOD develops bacterial infection. Treatment considerations?

Exercise 93: Progressive Multifocal Leukoencephalopathy

HIV patient with PML develops bacterial infection. Treatment approach?

Exercise 94: Acute Hepatitis B

Patient with acute HBV develops bacterial superinfection. Management?

Exercise 95: Immune Reconstitution Syndrome

Multiple IRIS events in HIV patient starting ART. Management strategy?

Exercise 96: Hepatic Adenoma

Patient with hepatic adenoma develops bacterial infection. Treatment approach?

Exercise 97: Visceral Leishmaniasis

HIV patient with visceral leishmaniasis and bacterial coinfection. Treatment?

Exercise 98: Chronic Cholestasis

Patient with chronic cholestatic disease develops infection. Drug considerations?

Exercise 99: HIV-Associated Malignancy

HIV patient with lymphoma develops opportunistic infection. Treatment approach?

Exercise 100: End-Stage Liver Disease

Patient awaiting liver transplant develops serious bacterial infection. Management?

Clinical Pearl: In HIV patients, CD4 count determines infection risk and treatment duration. CD4 <200 = PCP risk, CD4 <100 = toxoplasmosis risk, CD4 <50 = MAC risk. Always extend treatment durations in advanced HIV (CD4 <50), and remember that immune reconstitution can cause

IRIS requiring anti-inflammatory therapy alongside continued antimicrobials.

CHAPTER 14: PEDIATRIC INFECTIONS

Lice—Head/Body/Public

Lice infestations are caused by ectoparasites that feed on human blood, causing intense pruritus and secondary bacterial infections from scratching. Treatment involves topical pediculicides rather than systemic antibiotics, but secondary bacterial skin infections may require antibiotic therapy. Head lice (Pediculus humanus capitis) are most common in children, while pubic lice (Pthirus pubis) are sexually transmitted and body lice (Pediculus humanus corporis) are associated with poor hygiene and overcrowding.

Common Pathogens

- Head lice: Pediculus humanus capitis (ectoparasite, not bacteria)
- Body lice: Pediculus humanus corporis (ectoparasite, potential disease vector)
- Pubic lice: Pthirus pubis (ectoparasite, sexually transmitted)
- Secondary bacterial infections: Staphylococcus aureus, Streptococcus pyogenes
- Impetigo complications: MRSA, Streptococcus pyogenes
- Body lice-transmitted diseases: Rickettsia prowazekii (epidemic typhus), Bartonella quintana (trench fever)

Antibiotic Choices

1. Primary Lice Treatment (Non-Antibiotic)

First-line:

- Permethrin 1% cream rinse (head/pubic lice)
- Malathion 0.5% lotion (head lice, resistance)
- Benzyl alcohol 5% lotion (head lice)

2. Secondary Bacterial Skin Infections

First-line:

- Mupirocin 2% ointment topically TID × 5-7 days
- Cephalexin 500mg PO QID × 7-10 days

3. Impetigo/Cellulitis Complications

First-line:

- Clindamycin 300-450mg PO TID × 7-10 days
- Cephalexin 500mg PO QID × 7-10 days

4. MRSA Secondary Infection

First-line:

- Clindamycin 300-450mg PO TID × 7-10 days
- TMP-SMX 1-2 DS tablets PO BID × 7-10 days
- Doxycycline 100mg PO BID × 7-10 days

Standard Dosing

1. IV Antibiotics (Severe Secondary Infections)

Drug	Adult Dose	Pediatric Dose	Frequency
Vancomycin	15-20mg/kg	40-60mg/kg/day divided	Q8-12H
Clindamycin	600-900mg	25-40mg/kg/day divided	Q8H
Cefazolin	1-2g	100mg/kg/day divided	Q8H
Linezolid	600mg	30mg/kg/day divided	BID
Nafcillin	2g	150-200mg/kg/day divided	Q4H

2. Oral Antibiotics

Drug	Adult Dose	Pediatric Dose	Frequency
Cephalexin	500mg	50-100mg/kg/day divided	QID
Clindamycin	300-450mg	25-40mg/kg/day divided	TID
TMP-SMX	1-2 DS tablets	8-12mg/kg/day TMP	BID
Doxycycline	100mg	Not recommended <8yr	BID

Amoxicillin-clavulanate	875/125mg	45mg/kg/day divided	BID

3. Renal Adjustments

- Cephalexin: CrCl <50: Reduce dose 50%
- TMP-SMX: CrCl <30: Reduce dose 50%
- Vancomycin: Adjust based on levels and renal function
- Clindamycin: No adjustment needed
- Doxycycline: No adjustment needed

Organism Coverage

- Mupirocin: Staphylococcus aureus (including MRSA), Streptococcus pyogenes
- Cephalexin: Staphylococcus aureus (MSSA), Streptococcus pyogenes
- Clindamycin: MSSA, MRSA (if susceptible), Streptococcus pyogenes
- TMP-SMX: MSSA, MRSA (if susceptible), some gram-negatives
- Doxycycline: MSSA, MRSA (if susceptible), Streptococcus pyogenes

Contraindications

- Mupirocin: Hypersensitivity, avoid in nares for >5 days
- Cephalexin: Penicillin/cephalosporin allergy
- Clindamycin: Previous C. difficile colitis
- TMP-SMX: Sulfa allergy, severe renal impairment
- Doxycycline: Pregnancy, children <8 years

Adverse Effects

- Mupirocin: Local irritation, burning, contact dermatitis
- Cephalexin: GI upset, allergic reactions, C. difficile (rare)
- Clindamycin: C. difficile colitis, GI upset, rash
- TMP-SMX: Rash, hyperkalemia, bone marrow suppression
- Doxycycline: Photosensitivity, GI upset, tooth discoloration

Drug Interactions

- Mupirocin: Minimal systemic absorption, no significant interactions
- Cephalexin: Warfarin (↑INR), metformin (↑levels)
- Clindamycin: Neuromuscular blocking agents (↑paralysis)
- TMP-SMX: Warfarin (↑INR), ACE inhibitors (↑hyperkalemia)
- Doxycycline: Antacids (↓absorption), warfarin (↑INR)

Treatment Duration

- Primary lice treatment: Single application, repeat in 7-10 days if needed
- Secondary bacterial infections: 5-7 days for mild, 7-10 days for moderate
- Impetigo: 7-10 days
- Cellulitis: 7-10 days
- MRSA infections: 7-10 days minimum
- Continue until resolution of erythema and purulence

PRACTICAL EXERCISES

Exercise 1: Head Lice Diagnosis

8-year-old student with intense scalp itching and visible nits. No secondary infection. Treatment approach?

Exercise 2: Secondary Impetigo

Child with head lice develops honey-crusted lesions around hairline. Antibiotic choice?

Exercise 3: Adult Pubic Lice

25-year-old sexually active adult with pubic itching and visible lice. Treatment and counseling?

Exercise 4: Body Lice in Homeless

Homeless patient with body lice and multiple excoriations with purulent drainage. Management?

Exercise 5: Permethrin Resistance

Family treated with permethrin twice, lice persist. Alternative treatments?

Exercise 6: School Outbreak

Multiple children in classroom with head lice. School notification and management?

Exercise 7: Pregnant Woman

32-year-old pregnant woman (28 weeks) with head lice. Safe treatment options?

Exercise 8: MRSA Secondary Infection

Child with head lice develops cellulitis, culture shows MRSA. Antibiotic choice?

Exercise 9: Contact Treatment

Family member of head lice patient asks about prophylactic treatment. Recommendations?

Exercise 10: Treatment Failure

Patient with secondary skin infection not improving after 5 days cephalexin. Next steps?

Exercise 11: Infant Lice

6-month-old with suspected head lice. Treatment considerations?

Exercise 12: Immunocompromised Patient

HIV patient with CD4 200 develops body lice with secondary infection. Management?

Exercise 13: Allergic Reaction

Patient develops severe contact dermatitis from permethrin. Alternative treatments?

Exercise 14: Epidemic Typhus Risk

Refugee with body lice and fever. Disease transmission concerns?

Exercise 15: Eyelash Lice

Patient with pubic lice involving eyelashes. Treatment approach?

Exercise 16: Daycare Exposure

Daycare worker exposed to multiple children with head lice. Prevention strategies?

Exercise 17: Elderly Patient

85-year-old nursing home resident with body lice and cellulitis. Treatment considerations?

Exercise 18: Recurrent Infections

Family with repeated head lice infestations. Investigation and prevention?

Exercise 19: Environmental Treatment

Patient asks about treating home environment after lice infestation. Recommendations?

Exercise 20: STI Screening

Patient with pubic lice. Additional STI testing recommendations?

Exercise 21: Lindane Considerations

When is lindane use appropriate for lice treatment? Safety concerns?

Exercise 22: Nit Removal

Parent asks about nit removal after pediculicide treatment. Best practices?

Exercise 23: Clothing Treatment

Body lice patient asks about treating clothing and bedding. Instructions?

Exercise 24: Treatment During Breastfeeding

Breastfeeding mother with head lice. Safe treatment options?

Exercise 25: Scalp Infection

Child with head lice develops scalp abscess. Management approach?

Exercise 26: Alternative Medicine

Parent asks about home remedies for head lice. Evidence-based response?

Exercise 27: Asthma Considerations

Child with severe asthma has head lice. Treatment precautions?

Exercise 28: Permethrin Application

Proper technique for applying permethrin cream rinse. Patient education?

Exercise 29: Lice vs Dandruff

How to differentiate lice/nits from dandruff and other scalp conditions?

Exercise 30: Travel Considerations

Family planning international travel after lice treatment. Precautions?

Exercise 31: Benzyl Alcohol Use

8-year-old with head lice, parents prefer non-neurotoxic treatment. Options?

Exercise 32: Malathion Safety

Concerns about using malathion lotion in children. Safety profile?

Exercise 33: Combing Technique

Wet combing as lice treatment. Effectiveness and technique?

Exercise 34: Reinfestation Prevention

Patient successfully treated but worried about reinfestation. Prevention strategies?

Exercise 35: Ivermectin Oral

When is oral ivermectin considered for lice treatment? Dosing?

Exercise 36: Spinosad Treatment

Spinosad suspension for head lice. Indications and application?

Exercise 37: Heat Treatment

Using heat to kill lice and nits. Effectiveness and safety?

Exercise 38: Lice Shampoo

Over-the-counter lice shampoos. Effectiveness compared to prescription treatments?

Exercise 39: Trimethoprim-Sulfamethoxazole Dosing

12-year-old, 40kg with MRSA secondary infection. Calculate TMP-SMX dose.

Exercise 40: Mupirocin Application

Proper use of mupirocin ointment for secondary skin infections. Instructions?

Exercise 41: Essential Oils

Parent asks about tea tree oil for lice treatment. Evidence and safety?

Exercise 42: Lice Removal Service

Professional lice removal services. When to recommend?

Exercise 43: School Readmission

Child treated for head lice. School return criteria?

Exercise 44: Permethrin Resistance Testing

How to identify permethrin-resistant lice? Alternative approaches?

Exercise 45: Psychological Impact

Family experiencing anxiety and stigma from lice infestation. Support strategies?

Exercise 46: Coconut Oil Treatment

Coconut oil as lice suffocation method. Effectiveness?

Exercise 47: Lice Combs

Different types of lice combs. Selection and proper use?

Exercise 48: Mayonnaise Treatment

Home remedy using mayonnaise for lice. Scientific basis?

Exercise 49: Vacuum Treatment

Using vacuum for environmental lice control. Effectiveness?

Exercise 50: Olive Oil Suffocation

Olive oil as lice treatment method. Protocol and effectiveness?

Exercise 51: Lice Life Cycle

Understanding lice life cycle for treatment timing. Clinical relevance?

Exercise 52: Nit Comb Technique

Proper nit combing technique. Step-by-step instructions?

Exercise 53: Lice Transmission

How lice spread between people. Prevention education?

Exercise 54: Treatment Compliance

Ensuring proper treatment compliance in families. Strategies?

Exercise 55: Lice Myths

Common myths about lice transmission and treatment. Evidence-based corrections?

Exercise 56: Resistance Mechanisms

How lice develop resistance to treatments. Clinical implications?

Exercise 57: Environmental Persistence

How long lice survive away from host. Environmental control measures?

Exercise 58: Treatment Cost

Cost-effective lice treatment strategies. Insurance considerations?

Exercise 59: Lice Photography

Using photography to document lice/nits. Diagnostic value?

Exercise 60: Treatment Scheduling

Optimal timing between initial treatment and follow-up. Why 7-10 days?

Exercise 61: Lice Prevention

Evidence-based lice prevention strategies for high-risk groups?

Exercise 62: Treatment Monitoring

How to monitor treatment success. Follow-up protocols?

Exercise 63: Lice Identification

Differentiating live lice from nits and debris. Diagnostic techniques?

Exercise 64: Combination Therapy

Using multiple treatment modalities together. Synergistic effects?

Exercise 65: Treatment Side Effects

Managing side effects from pediculicide treatments. Mitigation strategies?

Exercise 66: Lice Size Variation

Size differences between lice species. Clinical relevance?

Exercise 67: Treatment Timing

Best time of day for lice treatment application. Practical considerations?

Exercise 68: Lice Mobility

How quickly lice move between hosts. Transmission implications?

Exercise 69: Treatment Storage

Proper storage of pediculicide products. Shelf life considerations?

Exercise 70: Lice Detection

Most sensitive methods for lice detection. Screening protocols?

Exercise 71: Treatment Efficacy

Comparing efficacy rates of different treatments. Evidence base?

Exercise 72: Lice Seasonality

Seasonal patterns in lice infestations. Public health implications?

Exercise 73: Treatment Contraindications

Medical conditions contraindicating specific treatments. Alternatives?

Exercise 74: Lice Epidemiology

Population groups at highest risk. Targeted interventions?

Exercise 75: Treatment Innovation

New lice treatments in development. Future directions?

Exercise 76: Lice Differentiation

Distinguishing between head, body, and pubic lice. Clinical features?

Exercise 77: Treatment Failure Investigation

Systematic approach to treatment failures. Diagnostic workup?

Exercise 78: Lice Public Health

When lice infestations become public health concerns. Reporting requirements?

Exercise 79: Treatment Patient Education

Essential patient education points for lice treatment. Communication strategies?

Exercise 80: Lice Stigma Reduction

Addressing stigma associated with lice infestations. Healthcare provider role?

Exercise 81: Treatment Quality Assurance

Ensuring quality in lice treatment programs. Monitoring systems?

Exercise 82: Lice Research Priorities

Current research gaps in lice management. Future studies needed?

Exercise 83: Treatment Guidelines

Following evidence-based guidelines for lice management. Implementation?

Exercise 84: Lice Emergency Management

Managing lice infestations in emergency settings. Protocols?

Exercise 85: Treatment Outcomes

Measuring success in lice treatment programs. Outcome metrics?

Exercise 86: Lice Prevention Programs

Developing effective lice prevention programs. Key components?

Exercise 87: Treatment Training

Training healthcare providers in lice management. Educational priorities?

Exercise 88: Lice Policy Development

Creating institutional policies for lice management. Essential elements?

Exercise 89: Treatment Resource Allocation

Optimizing resources for lice control programs. Cost-effectiveness?

Exercise 90: Lice Surveillance Systems

Monitoring lice infestations in populations. Surveillance design?

Exercise 91: Treatment Quality Improvement

Continuous improvement in lice treatment services. QI methodologies?

Exercise 92: Lice Community Engagement

Engaging communities in lice prevention efforts. Outreach strategies?

Exercise 93: Treatment Technology

Role of technology in lice detection and treatment. Innovation opportunities?

Exercise 94: Lice Health Disparities

Addressing disparities in lice treatment access. Equity considerations?

Exercise 95: Treatment Integration

Integrating lice management into broader health services. Systems approach?

Exercise 96: Lice Global Perspectives

International approaches to lice management. Best practices?

Exercise 97: Treatment Sustainability

Ensuring sustainable lice control programs. Long-term strategies?

Exercise 98: Lice One Health

One Health approach to lice management. Interdisciplinary collaboration?

Exercise 99: Treatment Innovation Adoption

Adopting new lice treatments in clinical practice. Implementation science?

Exercise 100: Lice Future Directions

Future of lice management. Emerging challenges and opportunities?

Clinical Pearl: Lice are ectoparasites, not bacteria - primary treatment is topical pediculicides (permethrin 1% first-line), NOT antibiotics. Antibiotics are only needed for secondary bacterial skin infections from scratching. Remember: "No live lice, no treatment needed" - nits alone don't require therapy or school exclusion.

ANSWER & EXPLANATIONS

Each exercise in this workbook includes detailed answer explanations that provide the clinical reasoning behind every decision. These explanations are designed to enhance your understanding and help you apply the concepts in real-world practice.

To access the complete answer explanations, scan the QR code below

CONCLUSION

This Antibiotic Mastery Workbook represents more than just a clinical reference—it's a practical tool designed to bridge the gap between theoretical knowledge and real-world patient care. Through over 1,000 exercises spanning common infections to bioterrorism scenarios, you've engaged with the complex decision-making that defines expert antibiotic prescribing.

The practice of infectious diseases medicine continues to evolve rapidly. Resistance patterns shift, new pathogens emerge, and treatment guidelines are updated regularly. What remains constant is the need for clinicians who can think critically, assess risk appropriately, and make evidence-based decisions under pressure. The exercises in this workbook have prepared you for these challenges by simulating the clinical reasoning required in daily practice.

Remember that antibiotic stewardship is not just about choosing the right drug—it's about choosing the right drug for the right patient at the right time for the right duration. Sometimes the best antibiotic decision is not to prescribe an antibiotic at all. The exercises emphasizing when NOT to treat are as valuable as those teaching optimal treatment selection.

The patients you serve deserve clinicians who approach antibiotic prescribing with both confidence and humility—confident in evidence-based decision-making, yet humble enough to recognize the complexity of infectious diseases and the responsibility that comes with antimicrobial therapy. Use these skills wisely to preserve the effectiveness of these life-saving medications for future generations.

Your mastery of antibiotic therapy begins here, but it never truly ends. Continue practicing, continue learning, and continue making a difference in the lives of your patients through expert infectious diseases management.